SOIL SURVEY OF

Franklin County, Pennsylvania

United States Department of Agriculture
Soil Conservation Service
In cooperation with
The Pennsylvania State University
College of Agriculture and the
Pennsylvania Department of Environmental Resources
State Conservation Commission

Major fieldwork for this soil survey was done in the period 1959–70. Soil names and descriptions were approved in 1971. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1970. This survey was made cooperatively by the Soil Conservation Service; The Pennsylvania State University, College of Agriculture; and the Pennsylvania Department of Environmental Resources, State Conservation Commission. It is part of the technical assistance furnished to the Franklin County Conservation District. Assistance was provided by the Franklin County Board of Commissioners.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability or limitations of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Franklin County are shown on the detailed soil map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described and the page where each capability unit is described.

Individual colored maps that show the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation for a given use. For example, soils that have a slight limitation can be colored green, those that have a moderate limitation can be colored yellow, and those that have a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units.

Foresters and others can refer to the subsection "Use of the Soils as Woodland" for information useful in the management of woodland.

Game managers, sportsmen, and others will find information useful in the maintenance, improvement, and development of wildlife habitat in the section "Use of the Soils for Wildlife."

Community planners and others can read about soil properties that affect the choice of homesites, industrial sites, schools, and parks in the subsections "Use of the Soils for Community Development" and "Use of the Soils for Recreational Development."

Engineers and builders will find, under "Use of the Soils for Engineering," tables that contain test data, estimates of soil properties, and interpretations pertinent to the design of engineering structures and practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Franklin County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "Environmental Factors Affecting Soil Use."

Cover: Stripcropping reduces erosion and runoff on Edom silty clay loam and Berks shaly silt loam.

Contents

Issued August 1975

SOIL SURVEY OF FRANKLIN COUNTY, PENNSYLVANIA

BY RICHARD S. LONG

FIELDWORK BY RICHARD S. LONG AND LARRY R. STALEY,
SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE PENNSYLVANIA STATE UNIVERSITY, COLLEGE OF AGRICULTURE, AND THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES, STATE CONSERVATION COMMISSION

FRANKLIN COUNTY is in the south-central part of Pennsylvania (fig. 1) and has a total area of 754 square miles, or 482,560 acres. It is within a few hours' driving distance of Harrisburg, Pittsburgh, Philadelphia, Washington, D.C., Baltimore, Maryland, and New York City. Census data in 1970 show a population of 100,833 for the county. Chambersburg, population 17,315, and Waynesboro, population 10,011, were the two largest cities.

The physiographic location of a large part of the county is in the Ridge and Valley Province, and a smaller part is in the Blue Ridge Province. Franklin County is bounded on the north by Juniata County; on the east by Perry, Cumberland, and Adams Counties; and on the west by Fulton and Huntington Counties. The southern boundary is part of the Mason-Dixon Line, which separates Maryland and Pennsylvania.

Dairying is the main source of farm income. General farm crops, fruits, and vegetables are of secondary importance. The raising of hogs, chickens, and beef is also important. The high income from the sale of farm products has been the result, in part, of the large acreage of productive soils.

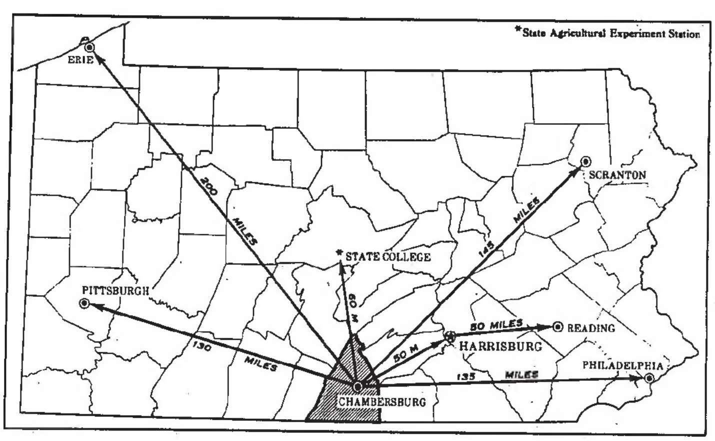

Figure 1.—**Location of Franklin County in Pennsylvania.**

The soils are of many different kinds. They formed in material weathered from shale, limestone, sandstone, quartzite, and metarhyolite. Most are suited to a number of different field crops, truck crops, and fruit trees.

Factories that manufacture precision tools, machines, and textiles and packaging plants are the major sources of employment. Several hundred people work in limestone and sand quarries and manufacture finished concrete products. Access to major highways and railroads has been an important factor in the development of industry in this county.

The Franklin County Conservation District was organized in 1956. The district helps its members get technical assistance from the Soil Conservation Service of the United States Department of Agriculture, from The Pennsylvania State University, and from others (*6*).[1]

How This Survey Was Made

Soil scientists made this survey to learn what kind of soils are in Franklin County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and some they had not. They observed the steepness, length, and shape of slopes; the size of streams; the kinds of native plants or crops; the kinds of rocks; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in neighboring counties and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

[1]Italic numbers in parentheses refer to Literature Cited, p. 120.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Most soil series are named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Hagerstown and Leetonia, for example, are the names of two soil series. A few soil series have names that were contrived; for example, the Penlaw series. All the soils in the United States that have the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Hagerstown silt loam, 3 to 8 percent slopes, is one of many phases of the Hagerstown series.

After a guide for classifying and naming the soil had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent because it is not practical to show on such a map all the small, scattered bits of other soils that have been seen within an area that is predominantly of a recognized soil phase.

Some mapping units are made up of soils of different series or of different phases within one series. Two such kinds of mapping units are shown on the soil map of Franklin County: undifferentiated groups and soil complexes.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not necessarily uniform. An area shown on the map may be made up of only one of the dominant soils or of both. The name of an undifferentiated group consists of the names of the dominant soils joined by "and." Dekalb and Lehew extremely stony soils, 25 to 75 percent slopes, is an example.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils joined by a hyphen. Bedington-Laidig complex, 2 to 8 percent slopes, is an example.

In most areas surveyed there are places where the soil material has been so drastically changed by the activities of man or is so stony and rocky that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Urban land and Very stony land, Dekalb soil material, are land types in Franklin County.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or to a high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil, and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Franklin County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

Soils of flood plains are not shown separately on the general soil map, but they form small parts of each soil association. They are nearly level in narrow bands along streams. The bands are so narrow that, in most places, they could not be shown separately on the general soil map. The main soils of the flood plains are those of the Pope, Philo, Atkins, Melvin, Nolin, and Warners series and the miscellaneous land type Alluvial land. The Pope and Nolin soils are well drained. The Philo soils are moderately well drained and are mottled in the lower part of the subsoil. The Atkins and Melvin soils are poorly drained. They are wet much of the time unless they have had artificial drainage. The Warners soils are very poorly drained.

The soil series in each association are described in detail in the section "Descriptions of the Soils." Most of the names and some of the boundaries of the Franklin County General Soil Map do not match those in earlier surveys. This is because of changes in the concept of some series, differing soil patterns observed between adjacent areas, and correlations that have combined some soils into other associations.

The soil associations in Franklin County are described on the pages that follow. Interpretations for selected uses are shown in table 1.

TABLE 1.—*Interpretations of soil*

[Interpretations are to be used only for planning general land use of geomorphic areas within Franklin County. Each association in the detailed soil maps at the back of this survey. Limitations are *slight* if they are minor and can easily be overcome; *moderate* nance, or a combination of these is needed to overcome them]

Soil associations and major soils	Percent of association[1]	Dominant slope	Suitability for— Crops[2]	Suitability for— Woodland[3]
1. Laidig-Very stony land-Buchanan association:		*Percent*		
Laidig soils	38	8–25	Not suited	Good
Very stony land	17	25–75	Not suited	Not suited
Buchanan soils	15	0–8	Good	Good
2. Hagerstown-Duffield association:				
Hagerstown soils	57	3–15	Excellent	Excellent
Duffield soils	10	3–8	Excellent	Excellent
3. Murrill-Laidig association:				
Murrill soils	75	3–15	Excellent to good	Good
Laidig soils	10	8–25	Not suited	Good
4. Highfield-Glenville association:				
Highfield soils	59	3–15	Excellent to good	Good
Glenville soils	9	3–8	Good	Very good
5. Weikert-Berks-Bedington association:				
Weikert soils	40	3–70	Not suited	Fair
Berks soils	20	2–15	Fair	Good
Bedington soils	10	3–25	Excellent to Good	Very good
6. Dekalb-Laidig-Very stony land association:				
Dekalb soils	20	3–75	Not suited	Poor
Laidig soils	20	8–25	Not suited	Good
Very stony land	17	25–75	Not suited	Not suited

[1] Percentage does not total 100 because the minor soils in each association are not listed in this table.
[2] A suitability rating of *excellent* indicates a predicted yield of more than 110 bushels per acre of corn; *good*, a yield of 96–110 bushels per acre; *fair*, a yield of 76–95 bushels per acre; *poor*, a yield of 75 or less bushels per acre; *not suited* indicates that the soils are generally too stony for use as cropland.

associations for selected uses

includes minor soils that have limitations different from those of the major soils, and the mapping units at specific sites are shown if they can be overcome by planning, design, or special maintenance; *severe* if costly soil reclamation, special design, intense mainte-

Limitations to use for—			
Homes with basements	Onsite sewage disposal	Campsites	Picnic and play areas
Severe: slope; stoniness	Severe: moderately slow permeability; slope.	Severe: slope; stoniness	Severe to moderate: slope; stoniness.
Severe: slope; stoniness	Severe: slope; bedrock at a depth of 1½ to 3½ feet.	Severe: stoniness; slope	Severe: slope; stoniness.
Severe: seasonal high water table.	Severe: seasonal high water table; slow permeability.	Moderate: slow permeability; gravelly material.	Moderate: gravelly material.
Moderate: slope; bedrock at a depth as shallow as 3½ feet; hazard of ground water pollution.	Moderate: slope; bedrock at a depth as shallow as 3½ feet; hazard of ground water pollution.	Slight to moderate: slope	Slight to moderate: slope.
Slight: hazard of ground water pollution.	Slight: hazard of ground water pollution.	Slight	Slight.
Slight to moderate: slope; hazard of ground water pollution.	Slight to moderate: slope; hazard of ground water pollution.	Moderate: gravelly material; slope.	Moderate: gravelly material; slope.
Severe: slope; stoniness	Severe: moderately slow permeability; slope.	Severe: slope; stoniness	Severe to moderate: slope; stoniness.
Moderate: slope; bedrock at a depth of 3½ to 6 feet.	Moderate: slope; bedrock at a depth of 3½ to 6 feet.	Moderate: channery material; slope.	Moderate: channery material; slope.
Severe: seasonal high water table.	Severe: seasonal high water table; moderately slow permeability.	Moderate: seasonal high water table; moderately slow permeability.	Moderate: channery material.
Moderate to severe: slope; bedrock at a depth of 1 to 1½ feet.	Severe: slope; bedrock at a depth of 1 to 1½ feet.	Severe: shaly material; slope.	Moderate to severe: shaly material; slope.
Moderate: slope; bedrock at a depth of 1½ to 3½ feet.	Severe: bedrock at a depth of 1½ to 3½ feet.	Moderate: shaly material; slope.	Moderate: shaly material; slope.
Slight to severe: slope	Slight to severe: slope	Moderate to severe: channery material; slope.	Moderate to severe: channery material; slope.
Severe: stoniness; slope; bedrock at a depth of 1½ to 3½ feet.	Severe: slope; bedrock at a depth of 1½ to 3½ feet.	Severe: stoniness; slope	Moderate to severe: stoniness; slope.
Severe: slope; stoniness	Severe: moderately slow permeability; slope.	Severe: slope; stoniness	Severe to moderate: slope; stoniness.
Severe: slope; stoniness	Severe: slope; bedrock at a depth of 1½ to 3½ feet.	Severe: stoniness; slope	Severe: slope; stoniness.

[3] A suitability rating of *excellent* indicates a site index for oak of 85 or more; *very good*, a site index of 75 to 84; *good*, a site index of 65 to 74; *fair*, a site index of 55 to 64; *poor*, a site index of less than 54.

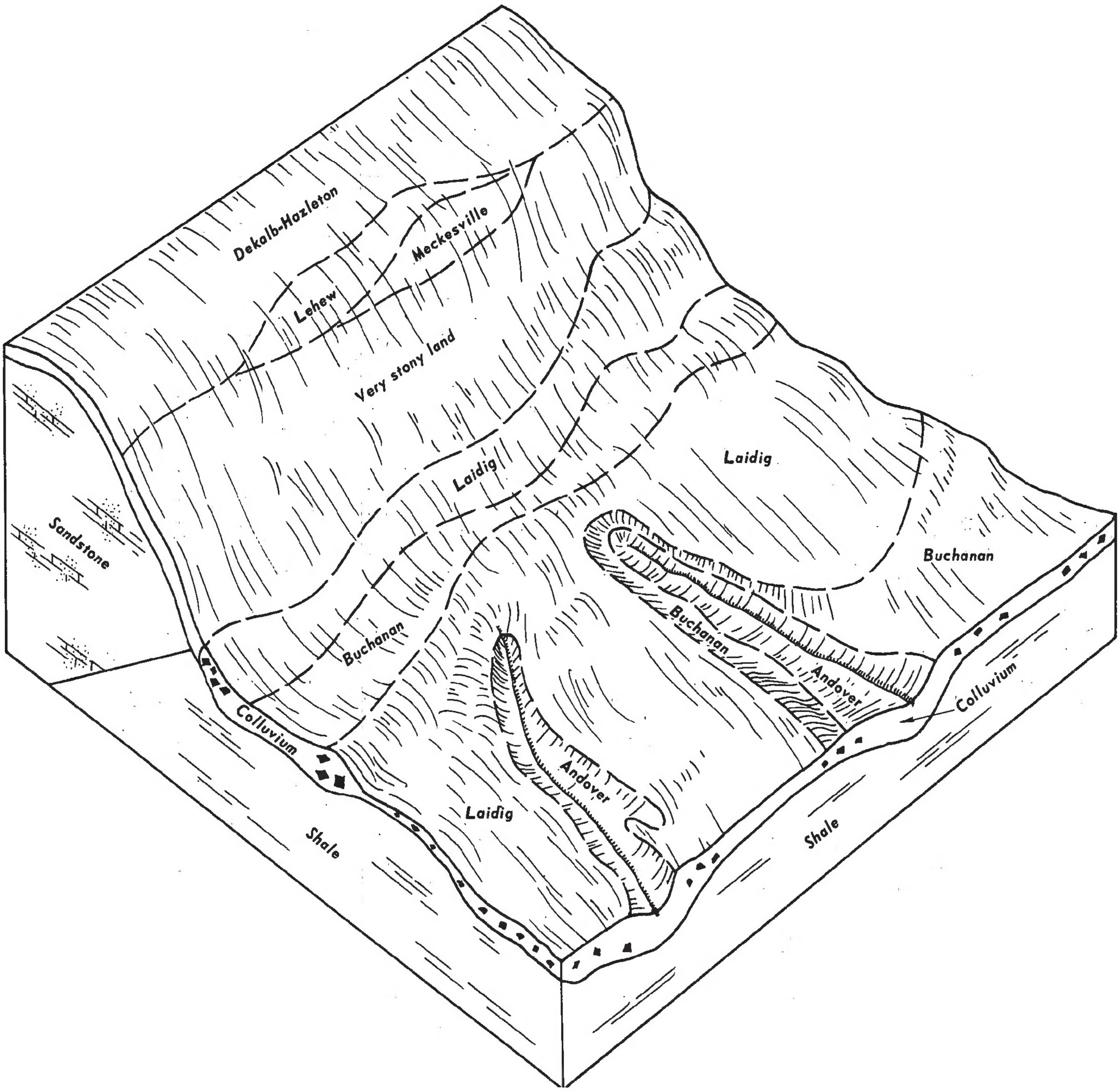

***Figure 2.*—Relationship of underlying material and topography in association 1.**

1. Laidig-Very stony land-Buchanan association

Deep, well drained to somewhat poorly drained, nearly level to very steep soils formed in colluvium from sandstone, and Very stony land; on tops and sides of mountains

This association (fig. 2) consists of soils and a land type on the tops and sides of Cove, Tuscarora, and Kittatinny Mountains.

This association makes up about 20 percent of the county. It is about 38 percent Laidig soils, 17 percent Very stony land, 15 percent Buchanan soils, and 30 percent minor soils. The Laidig soils are deep and well drained. The Buchanan soils are deep and moderately well drained and somewhat poorly drained. The minor

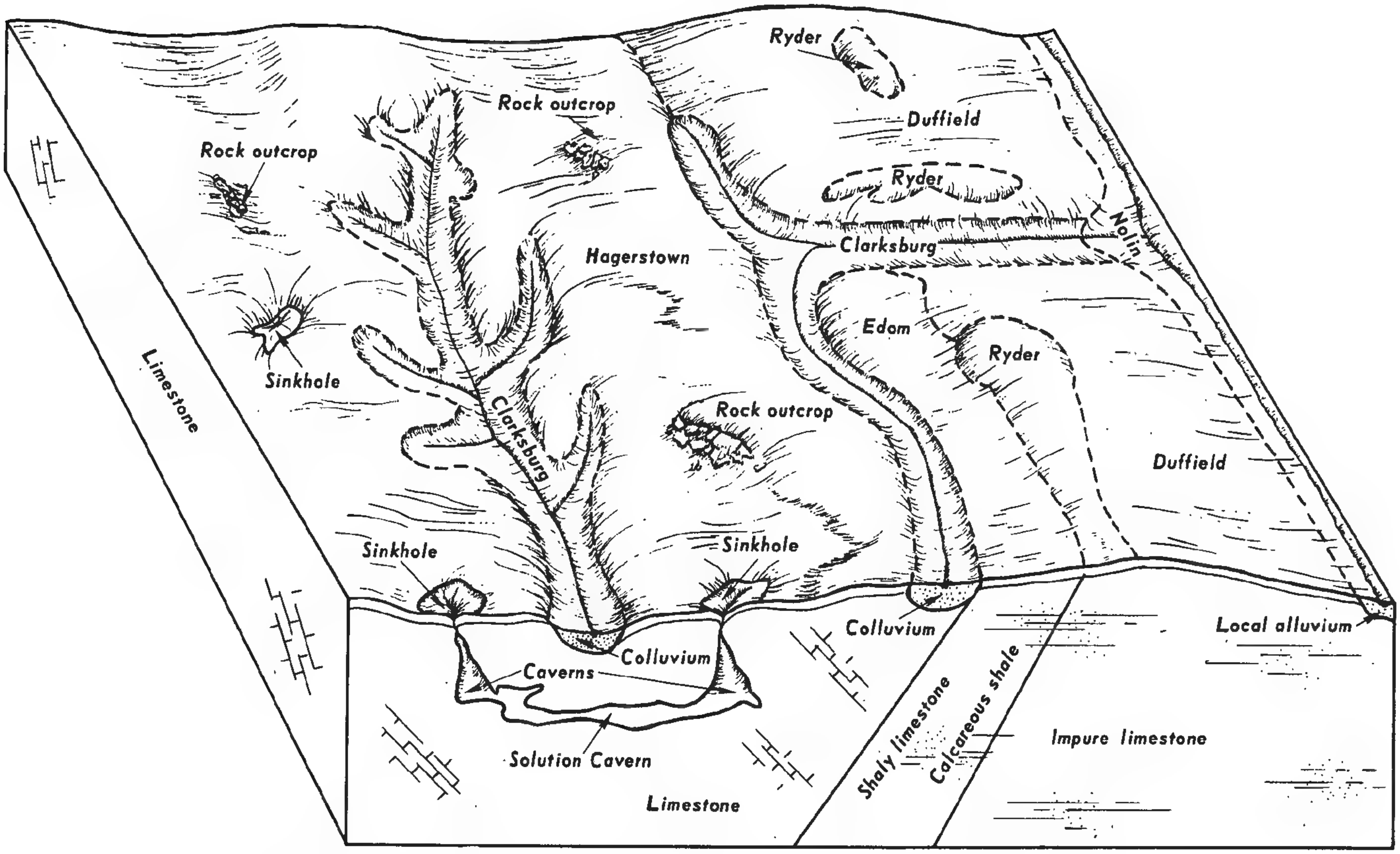

Figure 3.—**Relationship of underlying material and topography in association 2.**

soils are principally of the Lehew, Hazleton, Andover, Dekalb, and Meckesville series.

Nearly all of this association is wooded. Most of it is too stony for cultivation, although a few areas have been cleared and are used for crops, pasture, hay, or orchards. Stoniness and slope are the main limitations to use. About one-third of the State-owned land in the county is in this association.

2. *Hagerstown-Duffield association*

Deep, well-drained, nearly level to steep soils formed in materials weathered from limestone; in valleys

This association (fig. 3) consists of soils in the limestone valleys near Yeakle Mill, Metal, Willow Hill, Lemasters, Kasiesville, Greencastle, Waynesboro, Chambersburg, and Shippensburg.

This association makes up about 32 percent of the county. It is about 57 percent Hagerstown soils, 10 percent Duffield soils, and 33 percent minor soils. The Hagerstown and Duffield soils are deep and well drained. The minor soils are principally of the Clarksburg, Edom, Nolin, and Ryder series.

Nearly all of this association has been cleared and is used for crops, orchards, hay, and pasture. A few areas are used for urban and industrial developments. The soils are among the best in the county for farming, and they have few limitations for that use. Sinkholes are a limitation to some community development and engineering uses. Onsite disposal of sewage effluent could result in contamination of the ground water by drainage into the sinkholes or into solution caverns and channels in the underlying limestone.

3. *Murrill-Laidig association*

Deep, well-drained, gently sloping to moderately steep soils formed in colluvium; on mountain foot slopes

This association (fig. 4) consists of soils on the foot slopes of Kittatinny, Cove, and South Mountains.

This association makes up about 9 percent of the county. It is 75 percent Murrill soils, 10 percent Laidig soils, and 15 percent minor soils. The Murrill and Laidig soils are deep and well drained. The minor soils are principally of the Buchanan and Andover series.

Nearly all of this association has been cleared and is used for crops, hay, pasture, and orchards. A few areas, mostly the steep or stony ones, are wooded. The soils are among the best in the county for farming, and they have few limitations for that use. Sinkholes are a limitation to some uses. Onsite disposal of sewage effluent could result in contamination of the ground water by drainage into the sinkholes or into solution caverns and channels in the underlying limestone.

4. *Highfield-Glenville association*

Deep, well-drained to somewhat poorly drained, gently

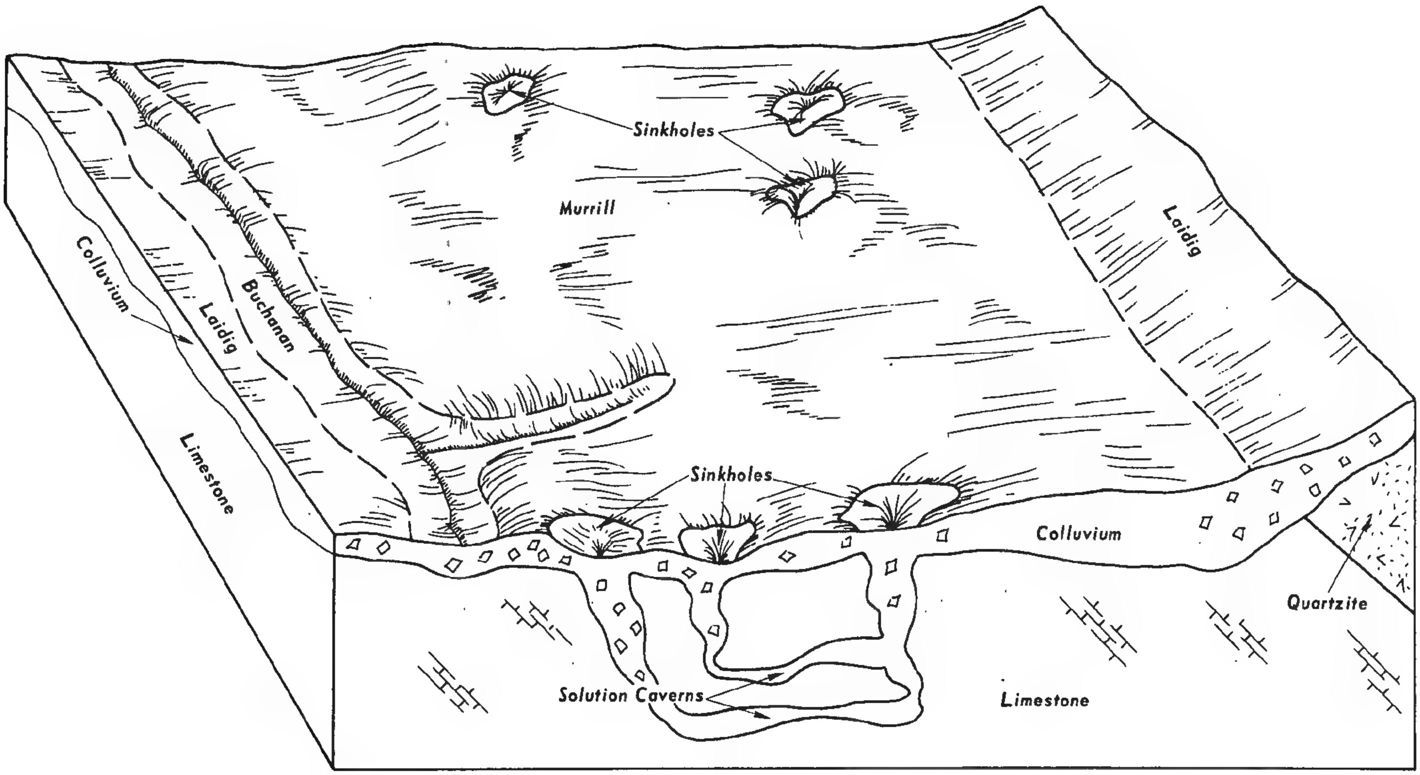

Figure 4.—**Relationship of underlying material and topography in association 3.**

sloping to very steep soils formed in materials weathered from metabasalt, rocks containing mica, and metarhyolite; on tops and sides of mountains

This association (fig. 5) consists of soils on the top and sides of South Mountain.

This association makes up about 2 percent of the county. It is about 59 percent Highfield soils, 9 percent Glenville soils, and 32 percent minor soils. The Highfield soils are deep and well drained. The Glenville soils are deep and somewhat poorly drained and moderately well drained. The minor soils are principally of the Laidig, Edgemont, Bedington, Hazleton, and Dekalb series.

Much of this association is wooded. Some areas have been cleared and are used for crops, hay, pasture, orchards, and urban development. Some are too stony and too steep for cultivation. Stoniness, slope, and sandstone fragments are the major limitations for most community development and recreational uses. About one-third of this association is State owned.

5. *Weikert-Berks-Bedington association*

Shallow to deep, well-drained, nearly level to very steep soils formed in materials weathered from shale and interbedded shale, siltstone, and sandstone; in valleys

This association (fig. 6) consists of soils in the valleys near Lurgan, Chambersburg, Cashtown, Worleytown, Markes, Sylvan, Fannettsburg, and Doylesburg.

This association makes up about 31 percent of the county. It is about 40 percent Weikert soils, 20 percent Berks soils, 10 percent Bedington soils, and 30 percent minor soils. The Weikert soils are shallow and well drained. The Berks soils are moderately deep and well drained. The Bedington soils are deep and well drained. The minor soils are principally of the Atkins, Brinkerton, Blairton, Markes, and Philo series.

Much of this association has been cleared and is used for crops. Some areas are wooded, particularly areas of steep soils. A few areas are used for urban development, and one area is Federally owned. Depth to bedrock, slope, and shale fragments are the major limitations.

6. *Dekalb-Laidig-Very stony land association*

Moderately deep and deep, well-drained, nearly level to very steep soils formed in colluvium and in materials weathered from sandstone and quartzite, and Very stony land; on tops and sides of mountains

This association (fig. 7) consists of soils and a land type on the top and sides of South Mountain.

This association makes up about 6 percent of the county. It is about 20 percent Dekalb soils, 20 percent Laidig soils, 17 percent Very stony land, and 43 percent minor soils. The Dekalb soils are moderately deep and well drained. The Laidig soils are deep and well drained. The minor soils are principally of the Hazleton, Edgemont, Leetonia, and Andover series.

Nearly all of this association is too stony for cultivation and is wooded. A few areas have been cleared or have been used for orchards, crops, hay, or pasture. Stoniness and slope are the main limitations. About two-thirds of the State-owned land in the county is in this association.

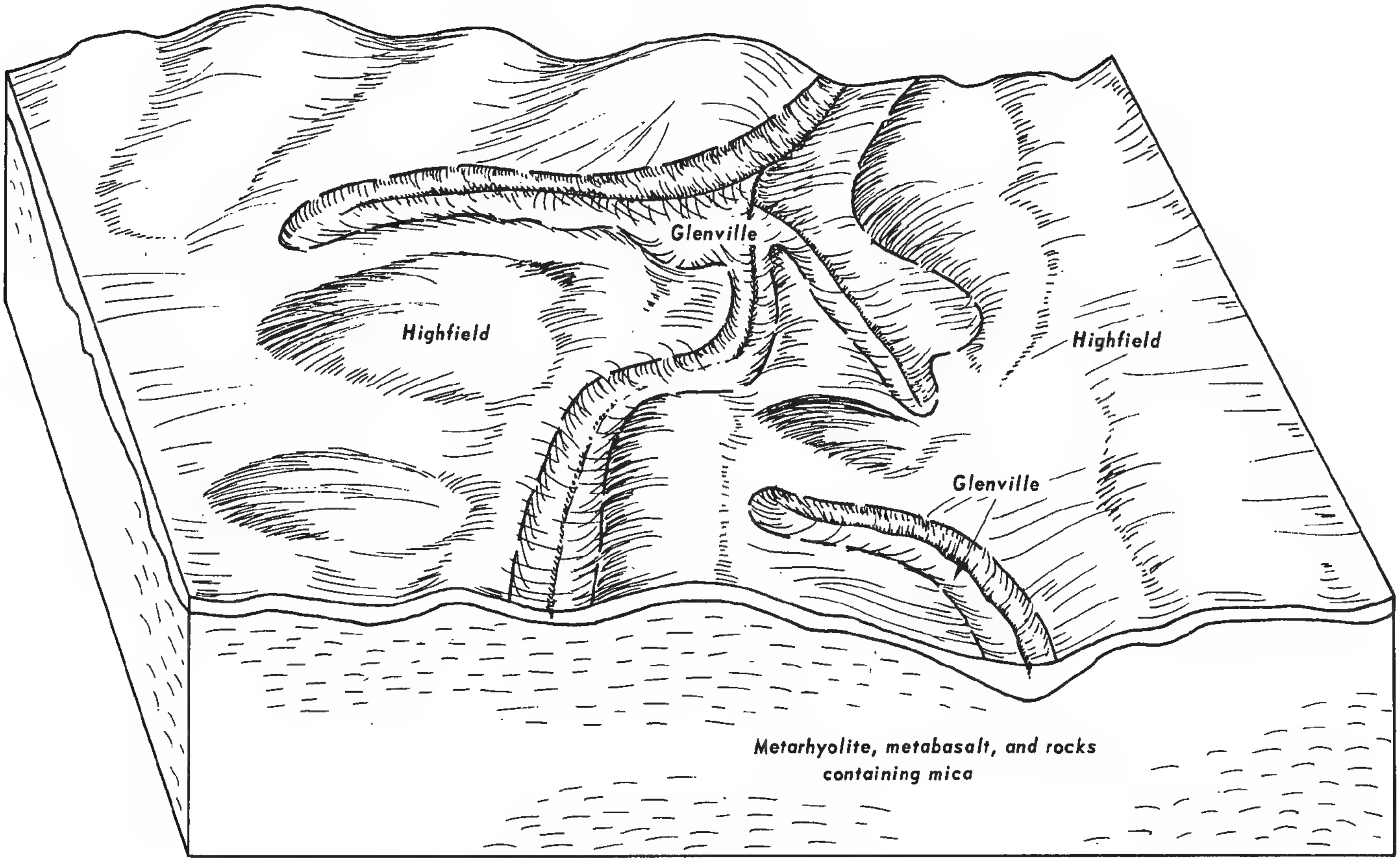

Figure 5.—**Relationship of underlying material and topography in association 4.**

Use and Management of the Soils

This section deals with the soils of Franklin County in relation to various uses and methods of management. It explains the system of capability classification used by the Soil Conservation Service and describes use and management of the soils for field crops and sown pastures, orchards, woodland, wildlife habitat, community development, recreational development, and engineering.

The soils of the county are used mainly for field crops, fruit crops, hay, pasture, and forest products. A few soils are used as sites for community development, some for wildlife food and cover, and some as sites for recreational facilities.

Management of the Soils for Field Crops and Sown Pastures [2]

Selecting a suitable crop rotation and applying soil-conserving practices to supplement this rotation in maintaining productivity of the soil and in controlling wetness or erosion are common needs in the management of farms in Franklin County. The practices to be applied depend on the nature of the soil and the intensity of the rotation used.

[2]ROBERT L. BOND, conservation agronomist, Soil Conservation Service, helped prepare this section.

Soil-conserving practices that can be applied on sloping soils are contour stripcropping, terracing, and sodding waterways. On sloping wet soils, surface water can be removed and erosion controlled by use of graded strips, terraces, and grassed waterways. Subsurface water can generally be removed by random tile lines or open ditches if suitable outlets are available.

Practices that maintain and improve the organic-matter content and structure of the soil and reduce erosion are growing winter cover crops, stubble mulching, minimum tillage, and growing green-manure crops. Such practices are needed most if rotation is intensive or cultivation continuous.

The most commonly grown crops in Franklin County are corn, wheat, oats, alfalfa, red clover, birdsfoot trefoil, timothygrass, and bromegrass. Lime and fertilizer should be applied according to soil tests and crop needs.

Additional help in managing the soils can be obtained by consulting the local representatives of the Soil Conservation Service, the County Extension Service, or members of the staff of the State Agricultural Experiment Station.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The

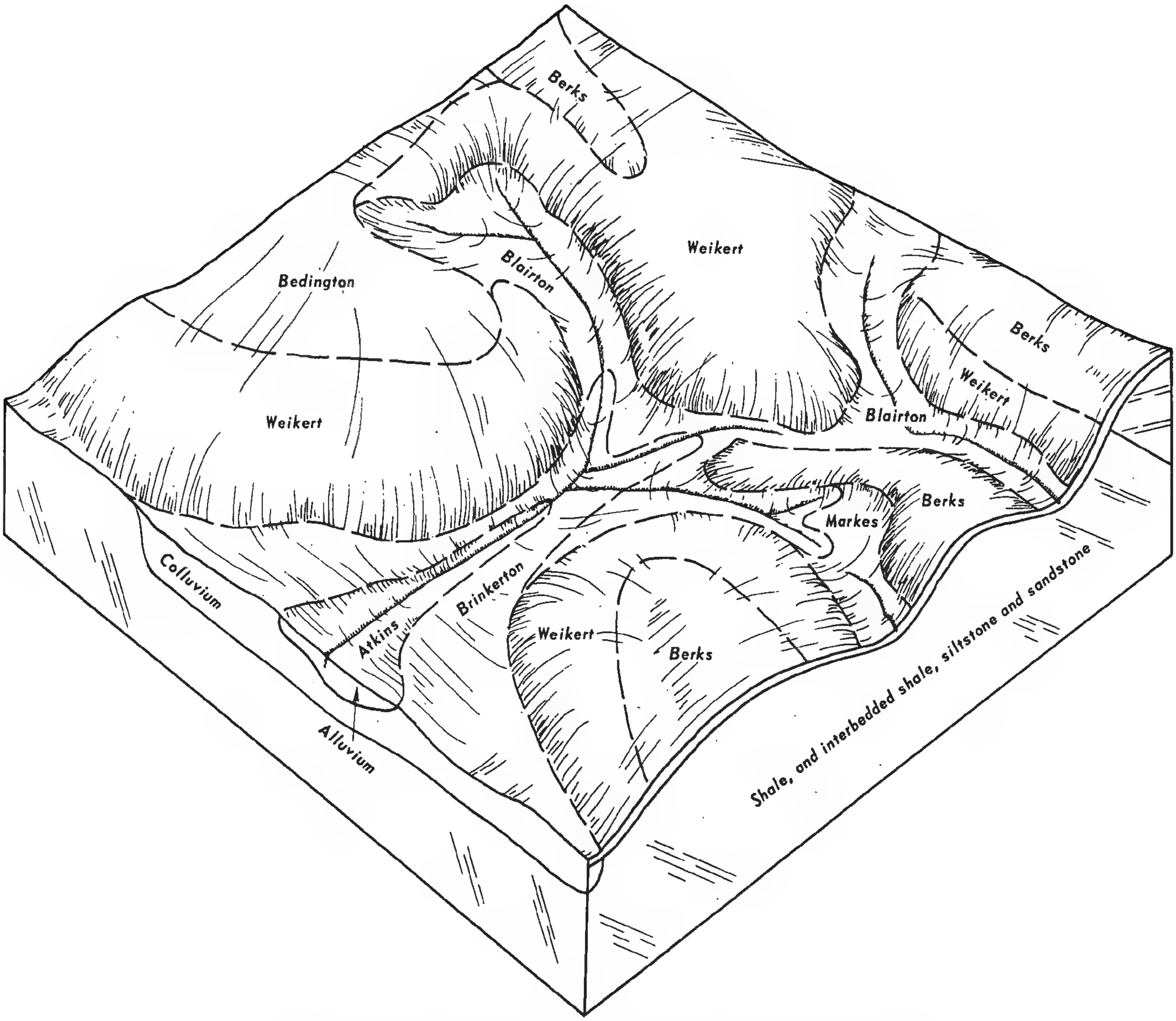

Figure 6.—**Relationship of underlying material and topography in association 5.**

soils are grouped according to their limitations when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forest trees or engineering.

In the capability system, the kinds of soils are grouped at three levels: the capability class, the subclass, and the unit. These levels are described in the paragraphs that follow.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce

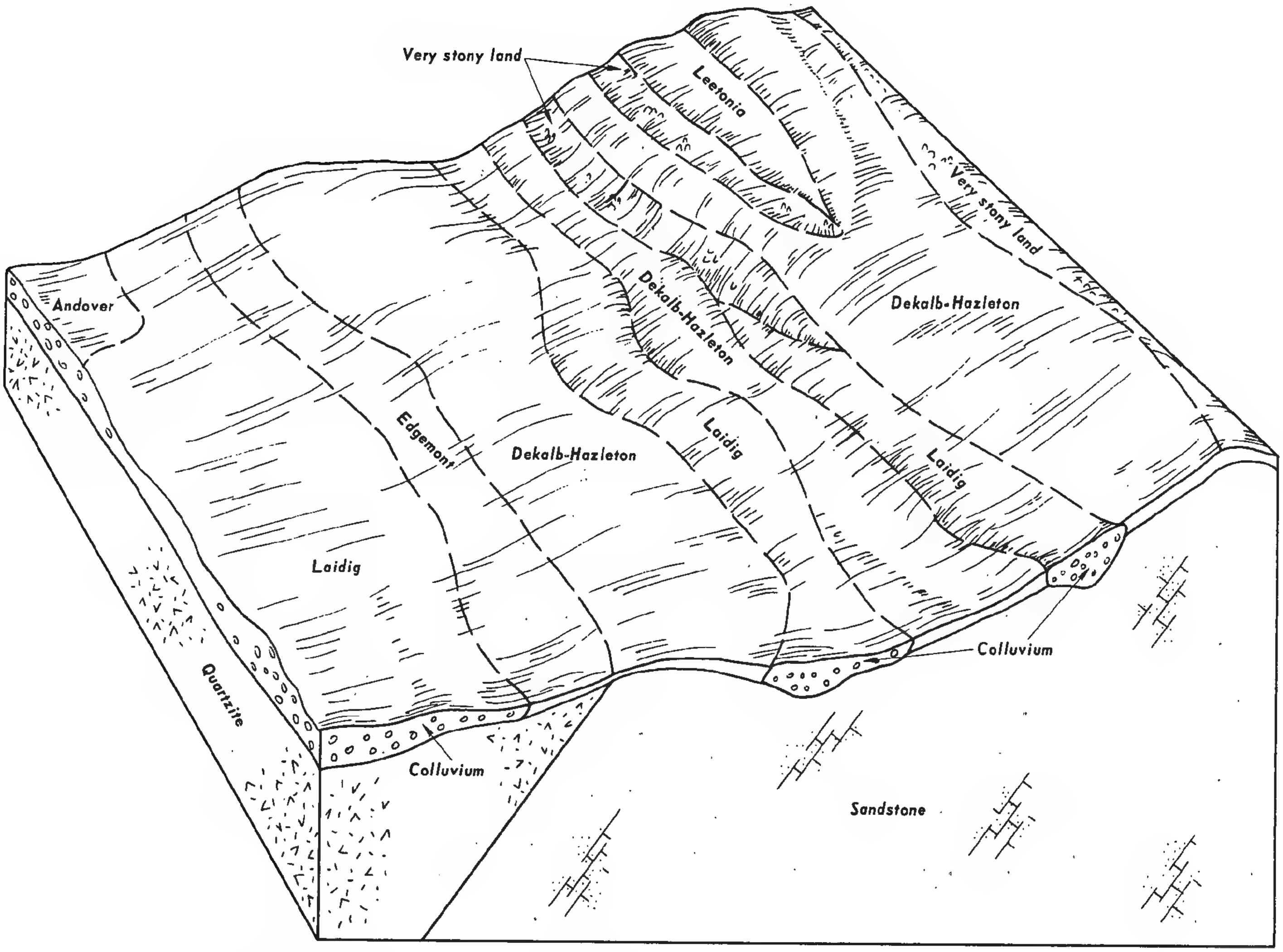

Figure 7.—**Relationship of underlying material and topography in association 6.**

the choice of plants or require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife. (None in Franklin County.)

Class VI soils have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture, range, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuitable for cultivation and restrict their use largely to pasture, range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, not used in Franklin County, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, although they have other limitations that

restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within each subclass.

On the following pages, the capability units in Franklin County are described, and suggestions for the use and management of the soils are given. The names of the soil series represented are mentioned in the description of each capability unit, but this does not necessarily mean that all the soils of a series appear in the unit. The capability classification of any given soil is shown in the Guide to Mapping Units.

CAPABILITY UNIT I-1

This unit consists of nearly level, deep, well-drained Nolin and Pope soils on flood plains. These soils formed in alluvial sediments washed from uplands underlain by sandstone, shale, and limestone. They have a surface layer of silt loam, loam, fine sandy loam, or sandy loam.

Permeability is moderate to moderately rapid, and the available moisture capacity is high. Reaction ranges from very strongly acid to neutral. The hazard of erosion is slight, and runoff is slow.

These soils are easily cultivated and are suited to all crops commonly grown in the county. They are well suited to truck crops. Crop residue and green-manure crops help maintain the organic-matter content and tilth of the soil. Cover crops protect the soil in winter and early in spring when the hazard of flooding is greatest. Grasses can be seeded in scoured channels.

CAPABILITY UNIT I-2

This unit consists of nearly level, deep, well-drained Duffield, Hagerstown, and Murrill soils. The Murrill soil formed in colluvial materials underlain by limestone, and the rest formed in materials weathered from limestone. All have a surface layer of silt loam or gravelly loam.

Permeability is moderate, and the available moisture capacity is moderate to high. Reaction ranges from strongly acid to mildly alkaline. The hazard of erosion is slight, and runoff is medium.

These soils are easily cultivated and are suited to all crops commonly grown in the county. They are suited to truck crops and to fruit trees where air drainage is adequate. Growing cover crops, incorporating crop residues, and including legumes and hay in the cropping system help maintain the organic-matter content and tilth of the soil.

CAPABILITY UNIT IIe-1

This unit consists of gently sloping, well-drained, deep Duffield, Hagerstown, and Murrill soils and moderately deep Ryder soils. These soils mainly formed in materials weathered from limestone, but the Murrill soil formed in colluvial materials underlain by limestone. The Murrill soil has a surface layer of gravelly loam, and the rest have a surface layer of silt loam.

Permeability is moderate to moderately rapid, and the available moisture capacity is moderate to high. Reaction ranges from strongly acid to mildly alkaline. The hazard of erosion is moderate, and runoff is medium.

These soils are easily cultivated and are suited to all crops commonly grown in the county. They are suited to fruit trees where air drainage is adequate. Stripcropping and the use of diversions, terraces, and sod waterways help control erosion and slow runoff. Cover crops, green-manure crops, barnyard manure, and crop residue help maintain the organic-matter content, improve tilth, and increase infiltration of rainfall (fig. 8).

CAPABILITY UNIT IIe-2

This unit consists of nearly level to sloping, deep, well-drained Allegheny, Bedington, Highfield, and Laidig soils. These soils formed in materials weathered from sandstone, metabasalt, shale, metarhyolite, or siltstone. They have a surface layer of loam, gravelly loam, channery loam, or channery silt loam.

Permeability is moderately slow to moderately rapid, and the available moisture capacity is moderate to high. Reaction ranges from extremely acid to neutral. The hazard of erosion is moderate, and runoff is medium.

These soils are suited to all crops commonly grown in the county. They are suited to fruit trees where air drainage is adequate. Stripcropping and the use of terraces and diversions help control or dispose of excess surface water and reduce erosion. Crop residue, green-manure crops, and cover crops help maintain the organic-matter content and tilth of the soil.

CAPABILITY UNIT IIe-3

This unit consists of nearly level and gently sloping,

Figure 8.—**Irrigation on Hagerstown silt loams, 3 to 8 percent slopes.**

deep, well-drained Edom and Hagerstown soils. These soils formed in materials weathered from limestone and calcareous shale. They have a surface layer of silty clay loam.

Permeability is moderate, and the available moisture capacity is moderate to high. Reaction ranges from slightly acid to mildly alkaline. The hazard of erosion is moderate, and runoff is medium to rapid.

These soils are suited to most crops commonly grown in the county. They are well suited to fruit trees where air drainage is adequate. The soils should not be cultivated when wet because the clay content is high and the shape of root crops may be unacceptable. Contour planting, stripcropping, and diversions are among the practices needed to slow runoff and control erosion. A high content of organic matter should be maintained.

CAPABILITY UNIT IIe-4

This unit consists of gently sloping, deep, well-drained Edgemont and Murrill soils. The Murrill soils formed in colluvium weathered from sandstone and shale underlain by limestone, and the Edgemont soils formed in quartzite and conglomerate. These soils have a surface layer of gravelly sandy loam or channery loam.

Permeability is moderate to moderately rapid, and the available moisture capacity is moderate to high. Reaction ranges from very strongly acid to neutral. The hazard of erosion is moderate, and runoff is medium.

These soils are suited to many crops commonly grown in the county and to fruit trees. Frequent applications of fertilizer are helpful on these soils. Cover crops, barnyard manure, green-manure crops, and crop residue help maintain the organic-matter content. Stripcropping, contour farming, diversions, and terraces are needed to control erosion and dispose of excess surface water.

CAPABILITY UNIT IIe-5

This unit consists of nearly level and gently sloping, deep, moderately well drained and somewhat poorly drained Buchanan, Edom, Glenville, and Monongahela soils. These soils formed in material weathered from acid shale, calcareous shale, and limestone; colluvium weathered from sandstone and shale; and acid crystalline rocks. They have a surface layer of silty clay loam, gravelly loam, silt loam, or channery silt loam.

Permeability is slow to moderately slow, and the available moisture capacity is moderate. Reaction ranges from extremely acid to mildly alkaline. The hazard of erosion is moderate, and runoff is slow to medium.

These soils are suited to all general farm crops, pasture grasses, and legumes commonly grown in the county. Water-tolerant varieties of alfalfa should be selected. Graded strips, diversions, and sod waterways help dispose of excess surface water and reduce erosion. Tile drains and drainage terraces help drain seeps and make possible more timely tillage and harvesting.

CAPABILITY UNIT IIe-6

Berks shaly silt loam, 2 to 8 percent slopes, the only soil in this unit, is moderately deep and well drained. It formed in materials weathered from acid shale, siltstone, and fine-grained sandstone.

Permeability is moderate to rapid, and the available moisture capacity is low. Reaction ranges from very strongly acid to neutral. The hazard of erosion is moderate, and runoff is medium.

This soil is suited to most general farm crops commonly grown in the county. Yields of deep-rooted crops and corn (fig. 9) are reduced because available moisture is low. Cover crops, crop residue, green-manure crops, and barnyard manure maintain the organic-matter content and tilth of the soil. Practices are needed that slow surface runoff and control erosion.

CAPABILITY UNIT IIw-1

This unit consists of nearly level, deep, moderately well drained and somewhat poorly drained Dunning overwash variant and Philo soils. These soils formed in stream deposits washed from uplands underlain by calcareous and acid rock. They have a surface layer of silt loam.

Permeability is moderate to moderately slow, and the available moisture capacity is moderate to high. Reaction ranges from strongly acid to slightly acid in the Philo soil and from medium acid to moderately alkaline in the overwash variant of the Dunning soil. The hazard of erosion is slight, and runoff is slow.

These soils are suited to most general farm crops commonly grown in the county. Cover crops should be grown to protect the soils from stream gouging during winter when the hazard of flooding is greatest. Artificial drainage increases the suitability of the soils for crops and makes possible more timely seedbed preparation.

CAPABILITY UNIT IIw-2

Clarksburg silt loam, the only soil in this unit, is nearly level, deep, and moderately well drained. It formed in colluvial materials weathered from limestone, sandstone, and shale.

Permeability is slow, and the available moisture capacity is moderate. Reaction ranges from strongly acid to neutral. The hazard of erosion is slight, and runoff is medium.

This soil is suited to most general farm crops commonly grown in the county. Terraces, open ditches, graded rows, and tile drains increase its suitability for crops and allow earlier preparation of the seedbed in spring.

CAPABILITY UNIT IIIe-1

This unit consists of sloping, well-drained, deep Duffield, Hagerstown, and Murrill soils and moderately deep Ryder soils. These soils formed mainly in materials weathered from limestone, but Murrill soils formed in colluvium weathered from sandstone and shale underlain by limestone. The Murrill soils have a surface layer of gravelly loam, and the rest have a surface layer of silt loam.

Permeability is moderate to moderately rapid, and the available moisture capacity is moderate to high. Reaction ranges from strongly acid to mildly alkaline. The hazard of erosion is high, and runoff is medium to rapid.

Figure 9.—**Corn on Berks shaly silt loam, 2 to 8 percent slopes.**

These soils are suited to most general farm crops grown in the county and to fruit trees. Diversions, stripcropping, terraces, and grassed waterways are among the practices needed to control surface water, reduce erosion, and conserve soil moisture.

CAPABILITY UNIT IIIe-2

This unit consists of sloping, deep, well-drained Bedington, Highfield, and Laidig soils. These soils formed in materials weathered from sandstone, metabasalt, metarhyolite, shale, or siltstone. They have a surface layer of channery loam, gravelly loam, or channery silt loam.

Permeability is moderately slow to moderately rapid, and the available moisture capacity is moderate to high. Reaction ranges from extremely acid to neutral. The hazard of erosion is high, and runoff is medium to rapid.

These soils are suited to most general farm crops commonly grown in the county and to fruit trees. Erosion control practices are needed that conserve the soil and increase soil moisture.

CAPABILITY UNIT IIIe-3

This unit consists of sloping, deep, well-drained Edom and eroded Hagerstown soils. These soils formed in materials weathered from limestone and calcareous shale. They have a surface layer of silty clay loam or silty clay.

Permeability and the available moisture capacity are moderate. Reaction ranges from slightly acid to mildly alkaline. Past erosion on the Hagerstown soils has been severe, and the hazard of further erosion is high on both soils. Runoff is rapid.

These soils are suited to most general farm crops grown in the county. Practices are needed that control surface water, reduce erosion, and conserve moisture. Green-manure crops, barnyard manure, and crop residue maintain or improve the organic-matter content and tilth of the soils.

CAPABILITY UNIT IIIe-4

This unit consists of sloping to moderately steep, deep, well drained Edgemont and Murrill soils and moderately well drained to somewhat poorly drained Buchanan soils. These soils formed in materials that range from colluvium weathered from sandstone and shale to conglomerate or quartzite. They have a surface layer of gravelly loam, gravelly sandy loam, or channery loam.

Permeability is slow in the Buchanan soil and moderate to moderately rapid in the rest. The available moisture capacity is moderate to high. Reaction ranges from extremely acid to slightly acid in the Buchanan and Edgemont soils and from strongly acid to neutral in the Murrill soils. The hazard of erosion is high, and runoff is medium to rapid.

These soils are suited to most general farm crops commonly grown in the county. The Edgemont and Murrill soils are also suited to fruit trees. Erosion

control is needed. Artificial drainage of the Buchanan soils increases their suitability for crops.

CAPABILITY UNIT IIIe-5

Berks shaly silt loam, 8 to 15 percent slopes, the only soil in this unit, is moderately deep and well drained. It formed in materials weathered from acid shale, siltstone, and fine-grained sandstone.

Permeability is moderate to moderately rapid, and the available moisture capacity is low. Reaction ranges from very strongly acid to neutral. The hazard of erosion is high, and runoff is medium.

This soil is suited to most general farm crops commonly grown in the county, but short periods of drought adversely affect most crops. Stripcropping (fig. 10), sod waterways, and diversions are needed to control erosion and conserve moisture.

CAPABILITY UNIT IIIe-6

Weikert shaly silt loam, 2 to 8 percent slopes, the only soil in this unit, is shallow and well drained. It formed in material weathered from interbedded shale, siltstone, and sandstone.

Permeability is moderately rapid, and the available moisture capacity is low to very low. Reaction ranges from very strongly acid to slightly acid. The hazard of erosion is slight, and runoff is rapid.

This soil is suited to most general farm crops commonly grown in the county, but periods of drought adversely affect crops during most years. The shallow depth to bedrock and unfavorable moisture capacity are the main limitations. Practices are needed that control erosion and conserve moisture.

CAPABILITY UNIT IIIw-1

This unit consists of nearly level, deep, poorly drained and very poorly drained Atkins, Melvin, and Warners soils. These soils formed in stream deposits on flood plains. They have a surface layer of silt loam.

Permeability is moderate to slow, and the available moisture capacity is high. Reaction ranges from very strongly acid to mildly alkaline. The hazard of erosion is slight, and runoff is slow.

Wetness during spring and winter makes these soils poorly suited to deep-rooted crops or to crops that are susceptible to winterkill. Artificial drainage increases the suitability of the soils for crops and makes possible timely tillage and harvesting. Cover crops should be grown to protect the soils from stream gouging during winter when the hazard of flooding is greatest.

CAPABILITY UNIT IIIw-2

This unit consists of nearly level, deep, somewhat poorly drained Penlaw and Tyler soils and nearly level and gently sloping, moderately deep, moderately well drained to somewhat poorly drained Blairton soils. The Blairton soils formed in materials weathered from shale, the Penlaw soils formed in colluvium, and the Tyler soils formed in stream deposits on terraces. These soils have a surface layer of silt loam.

Permeability is moderate to slow, and the available moisture capacity is moderate. Reaction ranges from

Figure 10.—Stripcropping helps control erosion on Berks shaly silt loam, 8 to 15 percent slopes

very strongly acid to neutral. The hazard of erosion is slight to moderate, and runoff is medium.

Wetness makes these soils poorly suited to deep-rooted crops or to crops that are susceptible to winterkill. Artificial drainage increases the suitability of the soils for crops and makes possible more timely tillage. Practices are needed that control runoff from adjacent higher areas.

CAPABILITY UNIT IIIs-1

This unit consists of nearly level to gently sloping, deep, well-drained Bedington, Laidig, and Murrill soils. These soils formed mainly in colluvial material, but the Bedington soil formed in material weathered from shale. The surface layer is cobbly sandy loam, channery silt loam, or cobbly loam.

Permeability is moderately slow to moderately rapid, and the available moisture capacity is moderate to high. Reaction ranges from extremely acid to neutral. The hazard of erosion is moderate, and runoff is medium.

These soils are suited to most general farm crops grown in the county, but cobblestones and channery fragments interfere with tillage and harvesting. Stripcropping, sod waterways, and diversions are among the practices needed to control erosion and conserve moisture.

CAPABILITY UNIT IVe-1

In this unit are moderately steep, moderately deep, well-drained Ryder soils; moderately steep, deep, eroded, well-drained Hagerstown soils; and sloping, deep, eroded, well-drained Duffield soils. These soils formed in materials weathered from limestone. They have a surface layer of silt loam or silty clay.

Permeability is moderate to moderately rapid, and the available moisture capacity is moderate to high. Reaction ranges from strongly acid to mildly alkaline. The hazard of erosion is high, and runoff is medium to rapid.

These soils are suited to some general farm crops commonly grown in the county. They are better suited to crops that require limited tillage than to others. Practices are needed that control erosion, conserve moisture, and maintain organic-matter content. Surface water should be controlled and diverted from long slopes.

CAPABILITY UNIT IVe-2

This unit consists of gently sloping and sloping, well-drained Weikert soils. These soils formed in materials weathered from shale, siltstone, and sandstone. They have a surface layer of shaly or very shaly silt loam.

Permeability is moderately rapid, and the available moisture capacity is low to very low. Reaction ranges from very strongly acid to slightly acid. The hazard of erosion is moderate to high, and runoff is rapid.

The shallow depth to bedrock, low to very low available moisture capacity, and high content of coarse fragments are limitations to use of these soils for crops. These soils are better suited to hay, pasture, or drought-resistant crops than to others. Practices are needed that conserve moisture, reduce runoff, and control erosion.

CAPABILITY UNIT IVw-1

This unit consists of nearly level and gently sloping, deep, poorly drained to very poorly drained Andover, Brinkerton, and Purdy soils on uplands or terraces. These soils formed in colluvium, shale, or stream deposits on terraces. They have a surface layer of gravelly silt loam, silt loam, or silty clay loam.

Permeability is slow, and the available moisture capacity is moderate to high. Reaction ranges from extremely acid to slightly acid. The hazard of erosion is slight to moderate, and runoff is slow to medium.

The poor drainage and slow permeability are limitations to use of these soils for crops (fig. 11). Artificial drainage is needed. Also, practices are needed that maintain the organic-matter content and tilth of the soil and reduce damage from erosion.

CAPABILITY UNIT IVw-2

This unit consists of nearly level, deep, very poorly drained and poorly drained Atkins clayey subsoil variant and Dunning soils. These soils formed in stream deposits washed from uplands underlain by shale, sandstone, and calcareous rocks. They have a surface layer of silty clay loam.

Figure 11.—**A poor stand of corn on Andover gravelly silt loam, 2 to 8 percent slopes, in contrast with a good stand on Murrill soil in background.**

Permeability is slow to moderately slow, and the available moisture capacity is high. Reaction ranges from very strongly acid to mildly alkaline. The hazard of erosion is slight, except for stream gouging during floods, and runoff is slow to very slow.

Cover crops should be grown to protect these soils from stream gouging during winter when the hazard of flooding is greatest. They are better suited to hay, pasture, or trees than to other uses. Suitable crops are those that tolerate wetness. Artificial drainage increases the suitability of the soils for crops and makes possible timely tillage and harvesting.

CAPABILITY UNIT IVw-3

Markes shaly silt loam, 2 to 8 percent slopes, is the only soil in this unit. It is moderately deep and poorly drained. It formed in materials weathered from shale.

Permeability is slow, and the available moisture capacity is low. Reaction ranges from strongly acid to neutral. The hazard of erosion is moderate, and runoff is medium.

Depth to bedrock, low available moisture capacity, and poor drainage are severe limitations to use of this soil for crops. Hay, pasture, or water-tolerant crops are better suited than other crops. Artificial drainage and control of runoff and erosion are needed.

CAPABILITY UNIT IVs-1

This unit consists of gently sloping and sloping, deep, well-drained, rocky Hagerstown soils. These soils formed in materials weathered from limestone. They have a surface layer of silty clay loam.

Permeability is moderate, and the available moisture capacity is moderate to high. Reaction ranges from slightly acid to neutral. The hazard of erosion is high, and surface runoff is medium to rapid.

Rocks severely limit the use of these soils for crops. The better suited crops are hay or pasture (fig. 11) or crops that require limited tillage. Practices are needed that reduce runoff, conserve moisture, and control erosion.

CAPABILITY UNIT IVs-2

This unit consists of sloping and moderately steep, deep, well-drained Bedington, Laidig, and Murrill soils. The Bedington soil formed in materials weathered from shale. The Laidig and Murrill soils formed in colluvium. The surface layer is cobbly sandy loam, cobbly loam, channery silt loam, or shaly silt loam.

Permeability is moderately rapid to moderately slow, and the available moisture capacity is moderate to high. Reaction ranges from extremely acid to neutral. The hazard of erosion is moderate to high, and runoff is medium.

The high content of cobblestones and other coarse fragments is a severe limitation to use of these soils for crops. The better suited crops are hay or pasture or crops that require limited tillage. Practices are needed that control runoff, conserve moisture, and protect the soil from erosion.

Figure 12.—**Typical pastured area of Hagerstown rocky silty clay loam, 3 to 8 percent slopes, eroded.**

CAPABILITY UNIT VIe-1

This unit consists of sloping and moderately steep, shallow, well-drained Weikert soils. These soils formed in materials weathered from interbedded shale, siltstone, and sandstone. They have a surface layer of shaly or very shaly silt loam.

Permeability is moderately rapid, and the available moisture capacity is low to very low. Reaction ranges from very strongly acid to slightly acid. The hazard of erosion is high, and runoff is rapid.

These soils are generally not suited to crops. If well managed, they are suited to pasture. They are suited to trees and wildlife habitat.

CAPABILITY UNIT VIw-1

Only Alluvial land is in this capability unit. It is on flood plains. It varies in texture, drainage, reaction, and degree of stoniness.

Alluvial land is suited to pasture, trees, and food or cover for wildlife. Cover crops should be grown to protect the soils from stream gouging during flooding. Surface or subsurface drains facilitate management of pasture.

CAPABILITY UNIT VIs-1

This unit consists of nearly level to steep, deep, well-drained Hagerstown soils (fig. 13) and Rock outcrop. These soils formed in material weathered from limestone. They have a surface layer of silty clay loam.

Permeability is moderate, and the available moisture capacity is moderate to high. Reaction ranges from slightly acid to neutral. The hazard of erosion is slight to high, and runoff is medium to rapid.

These soils are generally too rocky to be suitable for field crops or for pasture of good quality. If cleared of trees, they may be used for pasture. They are suitable

Figure 13.—**Hagerstown-Rock outcrop complex, 8 to 30 percent slopes, is typical of capability unit VIs–1.**

for trees and plantings for wildlife. Careful management is necessary for best results.

CAPABILITY UNIT VIIe–1

This unit consists of moderately steep and very steep, shallow, well-drained Weikert soils. These soils formed in materials weathered from shale, siltstone, and sandstone.

Permeability is moderately rapid, and the available moisture capacity is low to very low. Reaction ranges from very strongly acid to slightly acid. The hazard of erosion is high, and runoff is rapid to very rapid.

Slope, shallowness, coarse fragments, and low available moisture capacity generally limit the use of these soils to production of timber and plantings for wildlife. The forests need protection from fire and from grazing by cattle.

CAPABILITY UNIT VIIs–1

This unit consists of nearly level to moderately steep, moderately deep to deep, well-drained to excessively drained extremely stony Dekalb, Edgemont, Hazleton, Highfield, Laidig (fig. 14), Leetonia, Lehew, Meckesville, and Murrill soils and cobbly Vanderlip soils. These soils formed in a variety of materials.

Stoniness limits the use of these soils to growing trees for timber, wildlife habitat or recreational uses, or protection of the watershed. The forests should be managed so that a cover is maintained and desirable kinds of trees are encouraged. They need protection from fire and from grazing by cattle.

CAPABILITY UNIT VIIs–2

This unit consists of nearly level to moderately steep, deep, moderately well drained to somewhat poorly drained, extremely stony Buchanan soils and deep, nearly level and gently sloping, poorly drained, very stony Andover soils. These soils formed in colluvial materials.

Permeability is slow, and the available moisture capacity is moderate.

Stoniness and drainage generally limit the use of these soils to production of timber and plantings for wildlife. The forests need protection from fire and from grazing by cattle.

CAPABILITY UNIT VIIs–3

This unit consists of steep and very steep, deep and moderately deep, well-drained to excessively drained, extremely stony Dekalb, Highfield, Laidig, and Lehew

Figure 14.—Typical area of Laidig extremely stony sandy loam, 25 to 45 percent slopes.

soils and cobbly Vanderlip soils. These soils formed in a variety of materials.

Permeability is rapid to moderately slow, and the available moisture capacity is low to moderate.

Stoniness and slope limit the use of these soils to growing trees for timber, watershed protection, and wildlife habitat. The forests need protection from fire.

CAPABILITY UNIT VIIIs-1

Only Very stony land, Dekalb soil material, is in this capability unit. It is so stony that revegetation is difficult. The quality of trees is good, but yields are low.

This land is limited to wildlife habitat, scenery, and recreation. A permanent cover of trees should be maintained where possible to protect the watershed.

Estimated yields

Table 2 shows estimated yields for representative field and specialty crops grown in the county and for pasture. These estimates are averages for a period of 10 years or more, not just for one season. Suitability of the soil for orchards is also shown.

Estimated yields are shown under two levels of management. In columns A are the yields to be expected under the normal, or prevailing, management used by the average farmer in the county. In columns B are yields that can be obtained if improved management is practiced. Improved management means that farmers use most of the adapted crop varieties, fertilization rates, and insect and disease control measures currently recommended. Management practices are applied at the proper time and in such a way as to be of greatest effectiveness. Soil and water-conserving practices are minimum tillage, contour tillage, stripcropping, crop residue management, diversions, drainage, waterways, or other practices suggested by the Agricultural Extension Service and the Soil Conservation Service in Franklin County. Irrigation is not considered in the yield estimates. The yields in columns B are not intended to be maximum yields obtainable. They vary for the different soils, but usually represent an increase over present yields for the county. It is expected that yields, especially at the B level, will increase 10 to 25 percent by 1985, as a result of the development of new varieties and improved technology of production. Yields increased approximately 2 percent per year in Pennsylvania during the 1960's.

In table 2 the suitability of a soil for apple orchards is rated according to yields in bushels per acre for 45 trees of age 15 to 30 years. A rating of *very good* indicates 900 bushels or more; *good,* 725; *fair,* 450; *poor,* 300 or less.

The suitability of a soil for peach orchards is rated according to yields in bushels per acre for 80 trees of age 7 to 18 years. A rating of *very good* indicates 500 bushels or more; *good,* 400; *fair,* 250; *poor,* 150 or less.

The suitability of a soil for cherry orchards is rated according to yields in pounds per acre for 90 trees of age 10 years. A rating of *very good* indicates 13,500 pounds; *good,* 11,000; *fair,* 7,500; *poor,* 5,500 or less.

Use of the Soils for Orchards

Franklin County ranks second in Pennsylvania in the production of apples, peaches, and cherries. Apricots, plums, nectarines, and pears are also grown. Orchards occupy about 9,035 acres and are scattered throughout the county. Orchards are planted in areas where the soils are generally deep, well drained, and permeable to air and water. Air drainage is good where the topography is undulating or rolling. The climate of Franklin County is favorable for orchards. The growing season is fairly long, and there is generally enough rainfall to supply the moisture needed by fruit trees. However, moisture is deficient in some growing seasons. Beginning in the mid 1950's, irrigation (fig. 15) has been increasingly used to supplement rainfall and reduce frost damage.

Orchards are planted with the expectancy that the trees will be in production for 12 to 30 years. The normal production span for peach trees and sour cherry trees is 12 to 20 years. For apple trees and pear trees it is 20 to 30 years. A potential orchard site must meet certain standards before a grower considers planting fruit trees. The soil should be deep, medium textured, and well drained and have gentle to moderate slopes. The site must be higher than the surrounding area, so that air drainage is adequate. Slope aspect is important for some fruit trees. The availability of adequate

Figure 15.—**Pond constructed in a peach orchard on Hagerstown silt loam supplies water for irrigation, spraying, and recreation.**

amounts of water for spraying and irrigation increases the value of a site for fruit production.

Shallow, droughty soils that have low available moisture capacity should be avoided because fruit trees generally grow slowly and produce low yields on these soils. Areas of somewhat poorly drained and poorly drained soils are sometimes used in order not to leave open spaces in orchards. Generally, varieties of trees are used that can tolerate wetness and are late blooming. If ponded water remains around tree roots for 24 to 48 hours at a time, the trees wilt and do not grow well. Sweet cherry, peach, and apricot trees are the least tolerant of wet soil.

Soils on flood plains, such as the Pope soils, are generally not used for orchards because flooding is a hazard and surface air drainage is poor.

Table 2 shows the estimated suitability ratings for the soils in the county for orchards.

In Franklin County two soil associations are important for orchards. In order of their importance, these are the Murrill-Laidig and the Hagerstown-Duffield soil associations.

The Murrill-Laidig association has the best soils and the most desirable sites for orchards, all factors considered.

The Murrill soils have the largest acreage in orchards of any soil in the county. They are well drained, medium textured, and 6 feet or more deep over bedrock (fig. 16). They have a deep root zone, high available moisture

Figure 16.—**Apple trees on deep, well-drained Murrill gravelly loam, 3 to 8 percent slopes.**

capacity, and generally good surface air drainage. Permeability is moderate, and the capacity for storage of plant food is good. Murrill soils have slopes that range from nearly level to moderately steep, but gentle slopes are dominant.

Laidig soils are deep, well drained, and medium textured. Permeability is moderately slow in the subsoil at a depth of about 36 inches. This subsoil impedes the penetration of roots and moisture. Surface air drainage on the Laidig soils is generally satisfactory.

The small areas of the moderately well drained to somewhat poorly drained Buchanan soils and the poorly drained Andover soils in this association are frequently subject to frost. Consequently, the planting of fruit trees is not advisable, even if these soils are artificially drained.

The Hagerstown-Duffield association is the largest in the county, but it is second in its acreage in orchards. The single largest orchard in Franklin County is on this association, near St. Thomas and Edenville.

The deep, well-drained Hagerstown soils are dominant in this association. These soils formed in materials weathered from limestone. The areas of Hagerstown soils that have rolling topography generally have a higher percentage of limestone outcrops. These areas have good air drainage. Within the areas of Hagerstown soils are numerous flowing springs and deep wells that are a potential source of water for spraying and irrigation (fig. 17).

The Duffield soils formed in materials weathered from impure limestone. They are well drained, deep, and medium textured. Many areas of Duffield soils have long, uniform slopes that are not conducive to good air drainage. The more rolling areas are better suited to fruit trees because of better air drainage.

The small acreage of Ryder soils in this association occurs mostly on the upper slopes of low ridges in areas of Duffield soils. Because they are in higher positions, the Ryder soils are favorably located for good drainage. They are well drained, moderately deep, and medium textured. Sources of water are limited in areas of Duffield and Ryder soils. Also in this association are small areas of Nolin and Clarksburg soils. They are in low-lying positions and, consequently, are frequently subject to frost damage.

Use of the Soils as Woodland[3]

Franklin County originally had a dense cover of trees, but cutting for commercial purposes and clearing

[3] By V. C. MILES, woodland specialist, Soil Conservation Service.

Figure 17.—**Irrigation of peach orchard growing on Hagerstown silt loam supplements rainfall during critical periods in the growing season.**

TABLE 2.—*Estimated average yields per acre for selected*

[In columns A are yields for normal management, and in columns B are yields for improved management. The absence of

Soil	Corn Grain A	Corn Grain B	Corn Silage A	Corn Silage B	Oats A	Oats B	Wheat A	Wheat B
	Bu	*Bu*	*Tons*	*Tons*	*Bu*	*Bu*	*Bu*	*Bu*
Allegheny loam, 2 to 10 percent slopes	75	110	15	22	50	75	30	45
Alluvial land	....	....	....	....	....	....	....	....
Andover gravelly silt loam, 2 to 8 percent slopes	45	85	9	17	30	60	....	....
Atkins and Melvin silt loams	60	110	12	22	....	65	....	35
Atkins silty clay loam, clayey subsoil variant	....	90	....	18	....	55	....	....
Bedington channery loam, 3 to 8 percent slopes	70	115	14	23	50	70	25	95
Bedington channery loam, 8 to 15 percent slopes	65	105	13	21	45	65	20	40
Bedington-Laidig complex, 2 to 8 percent slopes	65	105	13	21	50	65	20	40
Bedington-Laidig complex, 8 to 25 percent slopes	55	85	11	17	45	55	15	35
Berks shaly silt loam, 2 to 8 percent slopes	50	80	10	16	40	60	20	35
Berks shaly silt loam, 8 to 15 percent slopes	45	75	9	15	35	55	15	35
Blairton silt loam, 0 to 3 percent slopes	45	75	9	15	35	60	20	35
Blairton silt loam, 3 to 8 percent slopes	45	75	9	15	35	60	20	35
Brinkerton silt loam, 0 to 3 percent slopes	....	90	....	18	....	60	....	35
Brinkerton silt loam, 3 to 8 percent slopes	....	90	....	18	....	60	....	35
Buchanan gravelly loam, 2 to 8 percent slopes	60	100	12	20	40	65	25	40
Buchanan gravelly loam, 8 to 15 percent slopes	55	90	11	18	35	60	20	35
Clarksburg silt loam	65	115	13	23	40	65	25	40
Duffield silt loam, 0 to 3 percent slopes	90	130	18	26	55	80	35	50
Duffield silt loam, 3 to 8 percent slopes	90	130	18	26	55	80	35	50
Duffield silt loam, 8 to 15 percent slopes	80	125	16	25	50	75	30	45
Duffield silt loam, 8 to 15 percent slopes, eroded	75	110	15	22	45	70	25	40
Dunning silty clay loam	60	100	12	20	....	....	....	....
Dunning silt loam, overwash variant	90	130	18	26	50	80	25	45
Edgemont channery loam, 3 to 8 percent slopes	60	100	12	20	45	70	25	45
Edgemont channery loam, 8 to 20 percent slopes	55	100	11	20	40	65	25	40
Edom silty clay loam, 2 to 8 percent slopes	60	105	12	21	45	65	25	40
Edom silty clay loam, 8 to 15 percent slopes	45	80	9	16	40	60	20	35
Edom silty clay loam, moderately well drained variant, 2 to 8 percent slopes	45	80	9	16	40	60	20	35
Glenville channery silt loam, 3 to 8 percent slopes	60	100	12	20	40	65	25	40
Hagerstown silt loam, 0 to 3 percent slopes	85	130	17	26	55	80	35	50
Hagerstown silt loam, 3 to 8 percent slopes	80	130	16	26	55	80	35	50
Hagerstown silt loam, 8 to 15 percent slopes	75	125	15	25	50	75	30	45
Hagerstown silty clay loam, 2 to 8 percent slopes	70	125	14	25	50	75	30	45
Hagerstown rocky silty clay loam, 3 to 8 percent slopes, eroded	....	....	....	....	....	....	....	....
Hagerstown rocky silty clay loam, 8 to 15 percent slopes, eroded	....	....	....	....	....	....	....	....
Hagerstown silty clay, 8 to 15 percent slopes, eroded	60	110	12	22	45	65	20	35
Hagerstown silty clay, 15 to 25 percent slopes, eroded	60	90	12	18	40	60	20	35
Hagerstown-Rock outcrop complex, 0 to 8 percent slopes	....	....	....	....	....	....	....	....
Hagerstown-Rock outcrop complex, 8 to 30 percent slopes	....	....	....	....	....	....	....	....
Highfield channery silt loam, 3 to 8 percent slopes	70	115	14	23	50	75	30	45
Highfield channery silt loam, 8 to 15 percent slopes	65	110	13	22	45	70	25	40
Laidig gravelly loam, 3 to 8 percent slopes	65	110	13	22	50	70	25	40
Laidig gravelly loam, 8 to 15 percent slopes	60	100	12	20	45	65	20	35
Markes shaly silt loam, 2 to 8 percent slopes	....	75	....	15	....	55	....	....
Monongahela silt loam, 3 to 8 percent slopes	60	100	12	20	40	65	25	40
Murrill gravelly sandy loam, 3 to 8 percent slopes	70	110	14	22	45	75	25	45
Murrill gravelly sandy loam, 8 to 15 percent slopes	60	110	12	22	40	70	20	40
Murrill cobbly sandy loam, 3 to 8 percent slopes	70	100	14	20	45	70	25	40
Murrill cobbly sandy loam, 8 to 15 percent slopes	60	90	12	18	40	65	20	35
Murrill gravelly loam, 0 to 3 percent slopes	75	120	15	24	50	75	30	45
Murrill gravelly loam, 3 to 8 percent slopes	75	120	15	24	50	75	30	45
Murrill gravelly loam, 8 to 15 percent slopes	70	110	14	22	45	70	25	40
Nolin silt loam, local alluvium	95	135	19	27	55	80	35	50
Penlaw silt loam	50	100	10	20	40	65	....	....
Philo silt loam	90	130	18	26	55	80	35	50
Pope soils	95	135	19	27	55	80	35	50
Purdy silty clay loam	....	90	....	18	....	60	....	....
Ryder silt loam, 3 to 8 percent slopes	70	110	14	22	50	75	30	45
Ryder silt loam, 8 to 15 percent slopes	65	100	13	20	45	70	25	40
Ryder silt loam, 15 to 25 percent slopes	60	90	12	18	40	65	20	35
Tyler silt loam	45	85	9	17	40	60	....	....
Warners silt loam	60	110	12	22	....	65	....	35
Weikert shaly silt loam, 2 to 8 percent slopes	....	....	....	....	35	50	15	25
Weikert shaly silt loam, 8 to 15 percent slopes	....	....	....	....	....	....	....	....
Weikert shaly silt loam, 15 to 25 percent slopes	....	....	....	....	....	....	....	....
Weikert very shaly silt loam, 3 to 8 percent slopes, eroded	....	....	....	....	....	....	....	....
Weikert very shaly silt loam, 8 ot 15 percent slopes, eroded	....	....	....	....	....	....	....	....

[1] Cow-acre-days is a term used to express the carrying capacity of pasture. It is the number of animal units carried per acre 1 cow, steer, horse, or mule; 5 hogs; or 7 sheep. An acre of pasture that provides 30 days of grazing for 2 cows, for example, has a

field and forage crops, and suitability ratings for orchards

data indicates that the soil is not suited to the specified crops at the specified level of management. Only arable soils are listed]

Hay				Pasture				Suitability for orchards					
Alfalfa grass mixture		Grass legume mixture		Blue-grass		Tall grass		Apples		Peaches		Cherries	
A	B	A	B	A	B	A	B	A	B	A	B	A	B
Tons	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]	*Cow-acre-days* [1]	*Cow-acre-days* [1]						
2.6	4.5	2.0	3.5	80	160	130	255	Fair	Good	Fair	Good	Poor	Fair.
......	......	......	......	40	60	......	......	......	......	......	......	......	......
......	......	1.6	2.5	65	115	80	145	......	......	......	......	......	......
......	......	2.4	3.0	95	135	120	170	......	......	......	......	......	......
......	......	1.1	3.0	45	135	55	170	......	......	......	......	......	......
2.6	5.0	2.0	3.5	80	160	130	285	Fair	Good	Fair	Good	Fair	Good.
2.5	4.5	2.0	3.5	80	160	125	255	Fair	Good	Fair	Good	Fair	Good.
2.1	4.5	1.5	3.0	60	135	105	255	Fair	Good	Fair	Good	Fair	Good.
2.0	3.5	1.4	2.5	55	115	100	200	Fair	Good	Fair	Good	Fair	Good.
2.1	3.5	1.6	3.0	65	135	105	200	Poor	Fair	Poor	Fair	Poor	Poor.
2.0	3.0	1.5	2.5	60	115	100	170	Poor	Fair	Poor	Fair	Poor	Poor.
......	2.5	1.8	2.5	70	115	100	145	......	......	......	......	......	......
......	2.5	1.7	2.5	65	115	105	145	......	......	......	......	......	......
......	......	1.5	2.5	60	115	75	145	......	......	......	......	......	......
......	......	1.6	2.5	65	115	80	145	......	......	......	......	......	......
2.1	3.5	1.7	3.0	70	135	105	200	Fair	Good	Poor	Fair	Poor	Fair.
2.0	3.5	1.7	3.0	70	135	100	200	Fair	Good	Poor	Fair	Poor	Fair.
2.1	3.5	1.7	3.0	70	135	105	200	......	......	......	......	......	......
3.1	5.0	2.5	3.5	100	160	155	285	Good	Very good	Good	Very good	Good	Very good.
3.0	5.0	2.3	3.5	90	160	150	285	Good	Very good	Good	Very good	Good	Very good.
2.9	4.5	2.3	3.0	90	135	145	255	Good	Very good	Good	Very good	Good	Very good.
2.7	4.5	2.1	3.0	85	135	135	255	Fair	Good	Fair	Good	Fair	Good.
......	......	1.4	3.0	55	135	70	170	......	......	......	......	......	......
3.2	4.5	2.7	3.5	110	160	160	255	......	......	......	......	......	......
2.0	3.5	1.8	3.5	70	160	115	200	Fair	Good	Fair	Good	Fair	Good.
1.8	3.0	1.8	3.0	70	135	115	190	Fair	Good	Fair	Good	Fair	Good.
2.4	4.0	1.9	3.0	75	135	120	230	Fair	Good	Fair	Fair	Fair	Fair.
2.3	3.5	1.8	3.0	70	135	115	200	Fair	Good	Fair	Fair	Fair	Fair.
2.1	3.5	1.7	3.0	70	135	105	200	Fair	Good	Poor	Poor	Poor	Poor.
2.1	3.5	1.7	3.0	70	135	105	200	......	......	......	......	......	......
3.1	5.0	2.5	3.5	100	160	155	285	Good	Very good	Good	Very good	Good	Very good.
3.0	5.0	2.3	3.5	95	160	150	285	Good	Very good	Good	Very good	Good	Very good.
2.9	4.5	2.3	3.0	90	155	145	255	Good	Very good	Good	Very good	Good	Very good.
2.7	4.5	2.1	3.5	85	160	135	255	Good	Very good	Good	Very good	Good	Very good.
2.1	3.5	1.7	2.5	65	130	100	200	Fair	Good	Fair	Good	Fair	Good.
2.1	3.5	1.7	2.5	65	130	100	200	Fair	Good	Fair	Good	Fair	Good.
2.4	4.0	1.9	3.0	75	135	210	230	Fair	Good	Fair	Good	Fair	Good.
2.2	3.5	1.7	2.5	65	130	110	200	Fair	Good	Fair	Good	......	......
......	......	......	......	65	130	......	......	......	......	......	......	......	......
......	......	......	......	65	130	......	......	......	......	......	......	......	......
2.6	4.5	2.0	3.5	80	160	130	255	Good	Very good	Good	Very good	Good	Very good.
2.5	4.0	2.0	3.0	80	135	125	230	Good	Very good	Good	Very good	Good	Very good.
2.6	4.0	2.0	3.0	80	135	130	230	Fair	Good	Poor	Fair	Poor	Fair.
2.5	4.0	2.0	3.0	80	135	125	230	Fair	Good	Poor	Fair	Poor	Fair.
......	......	1.6	2.5	65	115	80	145	......	......	......	......	......	......
2.1	3.5	1.7	3.0	70	135	105	200	Poor	Fair	......	......	......	......
2.3	4.5	1.8	3.5	75	160	115	255	Fair	Good	Fair	Good	Fair	Good.
2.3	4.0	1.8	3.0	70	135	115	230	Fair	Good	Fair	Good	Fair	Good.
2.3	4.0	1.8	3.0	75	135	115	230	Fair	Good	Fair	Good	Fair	Good.
2.3	3.5	1.8	2.5	70	115	115	200	Fair	Good	Fair	Good	Fair	Good.
2.7	4.5	2.1	3.5	85	160	135	255	Good	Very good	Good	Very good	Good	Very good.
2.6	4.5	2.0	3.5	80	160	130	255	Good	Very good	Good	Very good	Good	Very good.
2.5	4.0	2.0	3.0	80	155	125	230	Good	Very good	Good	Very good	Good	Very good.
3.6	5.0	2.8	3.5	110	160	180	285	......	......	......	......	......	......
......	......	1.5	3.0	60	135	75	170	......	......	......	......	......	......
3.6	5.0	2.8	3.5	110	160	160	255	......	......	......	......	......	......
3.6	5.0	2.8	3.5	115	160	180	285	......	......	......	......	......	......
......	......	1.5	2.5	60	115	75	145	......	......	......	......	......	......
2.4	4.0	1.9	3.0	75	135	120	230	Good	Very good	Good	Very good	Good	Very good.
2.3	3.5	1.8	3.0	70	135	115	200	Good	Very good	Good	Very good	Good	Very good.
2.2	3.0	1.7	2.5	65	115	110	170	Fair	Good	Fair	Good	Fair	Good.
......	3.0	1.5	3.0	60	135	75	170	......	......	......	......	......	......
......	......	2.4	3.0	55	135	70	170	......	......	......	......	......	......
......	......	1.2	2.0	50	90	60	115	......	......	......	......	......	......
......	......	1.1	2.0	45	90	55	115	......	......	......	......	......	......
......	......	......	......	30	60	......	......	......	......	......	......	......	......
......	......	1.1	2.0	45	90	55	115	......	......	......	......	......	......
......	......	......	......	30	60	......	......	......	......	......	......	......	......

multiplied by the number of days the pasture is grazed during a single grazing season without injury to the sod. An animal unit is carrying capacity of 60 cow-acre-days.

for farms eliminated nearly all the virgin stands of timber. The commercial woodland that now occupies 41 percent of the land area consists of second- and third-growth stands.

The principal forest types that make up the present woodland and the proportionate extent of each, as given by the Forest Service (*5*), follow:

	Percentage of total commercial woodland in the county
White pine Forests in which 50 percent or more of the stand is eastern white pine.	2
Virginia-pitch pine Forests in which 50 percent or more of the stand is Virginia pine, pitch pine, or other yellow pines, singly or in combination.	1
Oak-hickory Forests in which 50 percent or more of the stand is upland oak or hickory, singly or in combination. It also includes the yellow-poplar-oak type.	82
Elm-ash-red maple Forests in which 50 percent or more of the stand is American elm, black ash, or red maple, singly or in combination. In Pennsylvania predominantly red maple stands on upland sites make up most of the acreage in this broad type.	5
Maple-beech Forests in which 50 percent or more of the stand is sugar maple, beech, or yellow birch, singly or in combination. It includes the black cherry forest type.	7
Other oak types	3

Sawtimber makes up approximately 57 percent of the acreage in commercial forests, poletimber 34 percent, and seedlings and saplings 9 percent (*5*).

In general, the soils in this county can support a good growth of sugar maple, ash, yellow-poplar, and red oak. Trees grow slowly on the shallow soils and on the very poorly drained soils.

A landowner can encourage the more desirable kinds of trees in his woodland by using good woodland management. The soils and the climate of Franklin County are favorable. Help in planning a program of woodland improvement can be obtained from local technicians. How much effort the landowner is willing to make toward improving his woodland probably depends on general economic conditions.

Returns from excellent, very good, and good growing sites generally justify the expenditure of money for management purposes. However, consideration should be given to the potential yield, the quality of the particular species growing on the site, and the market potential. Low value species and high proportion of poor quality stems growing on such sites may prohibit the investment of money for management purposes. Also, the conversion of such areas from their present state to their potential capacity may not be economically justifiable.

Soils that are fair growing sites are the most difficult to appraise for management. A thorough appraisal of woodland as to species and quality on the site is essential, and the market possibility should be investigated. A proper analysis of all these interrelated factors is essential in determining the intensity of management.

The returns from the soils that are poor growing sites generally do not economically justify management for the production of wood products. In most cases, however, woodland is the most practical use for these soils. Because soil conditions are unfavorable, these soils generally do not show a profitable return in crops or grasses. Although returns may be slight to none, woodland is the most economical use.

Forty-five percent of the woodland in the county is classified as excellent, very good, and good woodland sites. Other woodland acreage is classified as follows: 25 percent fair sites, 29 percent poor sites, and 1 percent noncommercial.

Table 3 shows for each soil the management limitations and hazards, species suitability, and site quality for producing timber.

Erosion hazard depends on the amount or intensity of practices required to reduce or control the hazard of erosion on the different soils. A rating of *slight* indicates that the risk of erosion is low if wood products are harvested and that few, if any, practices are needed to control erosion. A rating of *moderate* indicates that erosion control measures are needed on skid and logging roads during and immediately after the harvesting of wood products. If the rating is *severe*, it means that erosion, especially gullying, is a severe hazard if wood products are harvested. Harvesting and logging should be done across the slope as much as possible. Skid trails and logging roads should be laid out on as low grades as possible, and water-disposal systems should be carefully maintained during logging. Erosion control measures are needed on logging roads and skid trails during and immediately after logging.

Equipment limitations are characteristics of the soils and topographic features that restrict or prohibit the use of equipment for harvesting trees or planting seedlings. Steepness of slope, stoniness, and wetness are the principal soil limitations that restrict the use of equipment. The rating is *slight* if there are few limitations. It is *moderate* if some problems exist, such as stones and boulders, moderately steep slopes, or wetness of the soil during part of the year. The rating is *severe* if prolonged wetness of the soil, steepness, or stoniness severely limit the use of equipment. If the rating is severe, track-type equipment is best for general use, and winches or similar special equipment are needed for some kinds of work.

Seedling mortality refers to the loss of naturally occurring or planted tree seedlings resulting from unfavorable characteristics of the soils. The rating is *slight* if no more than 25 percent of the planted seedlings is likely to die and satisfactory restocking from the initial planting can be expected. Adequate restocking ordinarily results from natural regeneration. A rating of *moderate* indicates that between 25 and 50 percent of planted seedlings is likely to die, and some replanting is ordinarily needed. Natural regeneration cannot always be relied upon for adequate and early restocking. A rating of *severe* indicates that more than 50 percent of planted seedlings is likely to die, and special preparation of the seedbed, superior planting techniques, and considerable replanting are needed for adequate and immediate restocking. Restocking cannot be expected to result

from natural regeneration if the rating for seedling mortality is severe.

Plant competition refers to the rate at which brush, grass, and undesirable trees are likely to invade the different kinds of soil. Plant competition is *slight* if unwanted plants do not prevent adequate natural regeneration and early growth or interfere with adequate development of planted seedlings. It is *moderate* if competing plants delay natural or artificial regeneration, both establishment and growth, but do not prevent the natural development of a fully stocked normal stand. Competition is *severe* if adequate natural or artificial regeneration can be obtained only by intensive site preparation and maintenance, including weeding.

Windthrow hazard evaluates the factors that control the development of trees roots and, consequently, the likelihood that trees will be uprooted by wind. A rating of *slight* indicates that normally no trees are blown down by wind. A rating of *moderate* indicates that some trees are expected to be blown down during periods of excessive soil wetness and high wind. If the rating is *severe,* many trees are expected to be blown down during periods of soil wetness and moderate or high winds.

Species suitability means that the listed trees are fast growing and have high economic value. In planning the development of an existing woods, it is advisable to review the list of trees. The objectives of the landowner determine which species to favor when plantations are to be started. The trees listed in the "for planting or seeding" column are the best for these particular soils.

Site quality indicates the general ability of soils to produce timber. The ratings are based on sample plots located within Franklin County and adjacent counties. Other soils in the county that have characteristics similar to those of the soils studied were assumed to have approximately the same rating.

Site ratings for oak are based on the average height attained by the dominant and codominant trees at age 50 years (*14*). Foresters using this rating can determine the volume of timber that normal stands will produce at different ages. A site index of 85 or better is rated *excellent,* and the expected yield at age 50 is 13,750 or more board feet per acre. Published data for oak do not go beyond site index 80 (International rule). A site index of 75 to 84 is rated *very good,* and the expected yield at age 50 is about 13,750 board feet per acre. A site index of 65 to 74 is rated *good,* and the expected yield at age 50 is about 9,750 board feet per acre. A site index of 55 to 64 is rated *fair,* and the expected yield at age 50 is about 6,300 board feet per acre. A site index of less than 54 is rated *poor,* and the expected yield at age 50 is less than 3,250 board feet per acre.

An *excellent* site for yellow-poplar (*10*) has a site index of 95 or better, and the expected yield at age 50 is 32,150 board feet per acre. A site index of 85–95 is rated *very good,* and the expected yield at age 50 is about 24,400 board feet per acre. A *good* site has a site index of 75 to 85 and is expected to yield 17,620 board feet per acre; a *fair* site rating (site index 65–75), is expected to yield 11,400 board feet per acre; and a *poor* site (site index 55–65) is expected to yield 5,600 board feet per acre.

The site index for other trees, such as white pine, sugar maple, and ash, varies somewhat, but the better sites have the taller trees of the same species at age 50 years. More information on site index for other tree species can be obtained from the United States Department of Agriculture Soil Conservation Service and the Bureau of Forestry, Pennsylvania Department of Environmental Resources.

Use of the Soils for Wildlife[4]

The kind and number of wildlife depend on the kind of soil. Soil affects wildlife through its influence on the vegetation. The vegetation, in turn, supplies wildlife food and cover.

Under natural conditions, the patterns or combinations of vegetation in an area depend on the distribution of the various kinds of soil. An area is inhabited by the kinds of wildlife that have their habitat requirements met by the vegetation in the area. If natural conditions in an area are altered, for example, by drainage used in managing farmland or woodland, the kinds and patterns of vegetation change. This change in vegetation results in a change in the kind and number of wildlife.

Kinds of wildlife

White-tailed deer are considered forest species, but they neither prefer nor do well in large, mature forests. They thrive where there is a combination of brush and young trees, lesser amounts of mature trees, and small, open areas of grasses and herbs. Deer can be found throughout Franklin County. The distribution and abundance of white-tailed deer are closely correlated to land use. Land use, in turn, is closely correlated to soil patterns. The largest concentrations of white-tailed deer are in the western part of the county along Tuscarora Mountain. This area is a narrow farmed valley that has wooded mountains on both sides. Deer utilize the wooded cover during the day and move onto the farms in the evening to feed.

Although deer populations are small where there is no wooded cover, the largest deer are found in the areas of intensive farming. These areas are within the Hagerstown-Duffield soil association. Within the last few years there has been an increase in the deer population in the southeastern corner of the county on the Dekalb-Laidig-Very stony land soil association. This area consists of mature woodland that is being harvested by clearcutting, which undoubtedly creates ideal habitat.

Pheasants are found in high concentration on the Hagerstown-Duffield soil association in the Cumberland Valley, which is the most intensively cultivated part of the county. Corn and alfalfa are the main crops.

Excellent populations of bobwhite quail occur in the southern part of the county in Montgomery Township. Contrary to popular opinion, the greatest concentrations of quail are not associated with the better farming lands, but are in areas of low-intensity farming where many farms are idle and growing up into tall grass and weeds. Such farms are mainly on Weikert soils interspersed with Laidig, Hagerstown, and Murrill soils.

[4] By CLAYTON L. HEINEY, wildlife biologist, Soil Conservation Service, in consultation with James Mort and Ronald Schmuck of the Pennsylvania Game Commission.

TABLE 3.—*Soil*

Soils and map symbols	Hazards and limitations					
	Erosion hazard	Equipment limitations	Seedling mortality	Plant competition		Windthrow hazard
				Conifers	Hardwoods	
Allegheny: AlB	Slight	Slight	Slight	Severe	Moderate	Slight
Alluvial land: Am. Not suited to commercial tree crops.						
Andover: AnB, AoB	Slight	Severe	Severe	Moderate	Moderate	Severe
Atkins and Melvin: As	Slight	Severe	Severe	Severe	Severe	Moderate
Atkins clayey subsoil variant: At	Slight	Severe	Severe	Severe	Severe	Severe
Bedington: BcB, BcC	Slight	Slight	Slight	Moderate	Slight	Slight
Bedington-Laidig: BdB, BdD	Moderate	Moderate	Slight	Moderate	Slight	Slight
Berks: BeB, BeC	Slight	Slight	Moderate	Moderate	Slight	Slight
Blairton: BlA, BlB	Slight	Slight	Slight	Moderate	Slight	Slight
Brinkerton: BrA, BrB	Slight	Severe	Severe	Moderate	Moderate	Severe
Buchanan:						
BuB, BuC	Slight	Slight	Slight	Moderate	Slight	Slight
BxB	Slight	Moderate	Slight	Moderate	Slight	Slight
BxD	Moderate	Moderate	Slight	Moderate	Slight	Slight
Clarksburg: Ck	Slight	Slight	Slight	Severe	Moderate	Slight
Dekalb and Hazleton: DeB, DeD	Slight	Moderate	Severe	Slight	Slight	Moderate
Dekalb and Lehew: DlF	Slight	Moderate	Severe	Slight	Slight	Moderate
Duffield:						
DsA, DsB, DsC	Slight	Slight	Slight	Severe	Moderate	Slight
DsC3	Moderate	Slight	Slight	Severe	Moderate	Slight
Dunning: Du	Slight	Severe	Severe	Severe	Severe	Severe
Dunning overwash variant: Dv	Slight	Slight	Slight	Severe	Moderate	Slight
Edgemont:						
EcB, EcC	Slight	Slight	Slight	Moderate	Slight	Slight
EdC	Slight	Moderate	Slight	Moderate	Slight	Slight
Edom: EeB, EeC	Slight	Slight	Slight	Severe	Moderate	Slight
Edom moderately well drained variant: ElB	Slight	Moderate	Slight	Moderate	Slight	Slight
Glenville: GlB	Slight	Slight	Slight	Severe	Moderate	Slight
Hagerstown:						
HeA, HeB, HeC	Slight	Slight	Slight	Severe	Moderate	Slight
HfB, HgB3, HgC3, HhC3	Slight	Moderate	Slight	Severe	Moderate	Slight
HhD3	Moderate	Moderate	Slight	Severe	Moderate	Slight
Hagerstown-Rock outcrop:						
HkB	Slight	Moderate	Slight	Severe	Moderate	Slight
HkD	Moderate	Severe	Slight	Severe	Moderate	Slight

interpretations for woodland

Species: To be favored in existing stands	Species: Suitable for planting or seeding	Site quality
Yellow-poplar, red oak, sugar maple, ash, black walnut.	Yellow-poplar, larch, Virginia pine, Norway spruce, black walnut, white pine.	Very good.
Red oak, ash, yellow-poplar, sugar maple, red maple	Yellow-poplar, larch, Norway spruce, white spruce, white pine.	Good.
Red maple, sycamore	White pine, white spruce	Fair.
Red maple, sycamore	White pine, white spruce	Poor.
Yellow-poplar, red oak, ash, sugar maple, black walnut.	Yellow-poplar, larch, white pine, Virginia pine, black walnut, Norway spruce.	Very good.
Yellow-poplar, red oak, ash, sugar maple, black walnut.	Yellow-poplar, larch, white pine, Virginia pine, black walnut, Norway spruce.	Very good.
Red oak, black oak, Virginia pine, white pine	Larch, Virginia pine, white pine, Norway spruce	Good.
Red oak, black oak, Virginia pine, yellow-poplar	Yellow-poplar, red oak, black oak, Virginia pine	Good.
Red oak, ash, sugar maple, red maple, yellow-poplar	Yellow-poplar, larch, white pine, Norway spruce, white spruce.	Good.
Red oak, yellow-poplar, ash, sugar maple	Yellow-poplar, larch, white pine, Norway spruce, white spruce.	Good.
Red oak, yellow-poplar, ash, sugar maple	Yellow-poplar, larch, white pine, Norway spruce, white spruce.	Good.
Red oak, yellow-poplar, ash, sugar maple	Yellow-poplar, larch, white pine, Norway spruce, white spruce.	Good.
Red oak, ash, sugar maple, yellow-poplar	Yellow-poplar, larch, Norway spruce, white pine	Very good.
Black oak, chestnut oak, red maple, Virginia pine	Virginia pine, white pine, pitch pine	Poor.
Black oak, chestnut oak, red maple, Virginia pine	Virginia pine, white pine, pitch pine	Poor.
Yellow-poplar, black walnut, red oak, ash, sugar maple.	Yellow-poplar, black walnut, larch, Norway spruce, white pine.	Excellent.
Yellow-poplar, black walnut, red oak, ash, sugar maple.	Yellow-poplar, black walnut, larch, Norway spruce, white pine.	Excellent.
Red maple, sycamore	White pine, white spruce	Poor.
Yellow-poplar, black walnut, red oak, ash, sugar maple.	Yellow-poplar, larch, white pine, black walnut, Norway spruce.	Poor.
Red oak, ash, Virginia pine, white pine, yellow-poplar, sugar maple.	Yellow-poplar, Virginia pine, Norway spruce. white pine, larch.	Good.
Red oak, ash, Virginia pine, white pine, yellow-poplar, sugar maple.	Yellow-poplar, Virginia pine, Norway spruce, white pine, larch.	Good.
Red oak, ash, red maple, yellow-poplar, sugar maple, white pine, Virginia pine.	Yellow-poplar, larch, Norway spruce, white pine	Very good.
Yellow-poplar, ash, red maple, red oak, sugar maple.	Yellow-poplar. Norway spruce, larch, white pine	Good.
Red oak, ash, sugar maple, Virginia pine, yellow-poplar.	Yellow-poplar, Virginia pine, Norway spruce, white pine, larch.	Very good.
Yellow-poplar, black walnut, red oak, ash, sugar maple.	Yellow-poplar, black walnut, larch, Norway spruce, white pine.	Excellent.
Yellow-poplar, black walnut, red oak, ash, sugar maple.	Yellow-poplar, black walnut, larch, Norway spruce, white pine.	Excellent.
Yellow-poplar, black walnut, red oak, ash, sugar maple.	Yellow-poplar, black walnut, larch, Norway spruce, white pine.	Excellent.
Yellow-poplar, black walnut, red oak, ash, sugar maple.	Yellow-poplar, black walnut, larch, Norway spruce, white pine.	Excellent.
Yellow-poplar, black walnut, red oak, ash, sugar maple.	Yellow-poplar, black walnut, larch, Norway spruce, white pine.	Excellent.

TABLE 3.—*Soil*

Soils and map symbols	Hazards and limitations					
	Erosion hazard	Equipment limitations	Seedling mortality	Plant competition		Windthrow hazard
				Conifers	Hardwoods	
Highfield:						
HIB, HIC	Slight	Slight	Slight	Moderate	Slight	Slight
HmD	Slight	Moderate	Slight	Moderate	Slight	Slight
HmF	Moderate	Severe	Slight	Moderate	Slight	Slight
Laidig:						
LaB, LdB, LdC	Slight	Slight	Slight	Moderate	Slight	Slight
LaD	Slight	Moderate	Slight	Moderate	Slight	Slight
LaE	Moderate	Severe	Slight	Slight	Slight	Slight
Leetonia: LeB	Slight	Slight	Severe	Moderate	Slight	Slight
Lehew: LhD	Slight	Moderate	Moderate	Slight	Slight	Slight
Markes: MaB	Slight	Severe	Severe	Moderate	Moderate	Severe
Meckesville: McD	Moderate	Moderate	Slight	Severe	Moderate	Slight
Monongahela: MoB	Slight	Slight	Slight	Moderate	Slight	Slight
Murrill:						
MrB, MrC, MuB, MuC, MwA, MwB, MwC	Slight	Slight	Slight	Moderate	Slight	Slight
MvB, MvD	Slight	Moderate	Slight	Moderate	Slight	Slight
Nolin: No	Slight	Slight	Slight	Severe	Moderate	Slight
Penlaw: Pe	Slight	Moderate	Moderate	Severe	Severe	Slight
Philo: Ph	Slight	Slight	Slight	Severe	Moderate	Slight
Pope: Po	Slight	Slight	Slight	Severe	Moderate	Slight
Purdy: Pu	Slight	Severe	Severe	Moderate	Moderate	Severe
Ryder:						
RyB, RyC	Slight	Slight	Moderate	Moderate	Slight	Slight
RyD	Moderate	Moderate	Moderate	Moderate	Slight	Slight
Tyler: Ty	Slight	Moderate	Moderate	Severe	Severe	Moderate
Urban land: Ur. Not suited to commercial tree crops.						
Vanderlip:						
VaD	Slight	Moderate	Severe	Slight	Slight	Slight
VaE	Moderate	Severe	Severe	Slight	Slight	Slight
Very stony land, Dekalb soil material: Vd. Not suited to commercial tree crops.						
Warners: Wa	Slight	Severe	Severe	Severe	Severe	Severe
Weikert:						
WeB, WeC	Slight	Slight	Severe	Slight	Slight	Moderate
WeD	Slight	Moderate	Severe	Slight	Slight	Moderate
WeF	Moderate	Severe	Severe	Slight	Slight	Moderate
WkB3, WkC3	Moderate	Slight	Severe	Slight	Slight	Moderate
WkD3	Severe	Moderate	Severe	Slight	Slight	Moderate

interpretations for woodland—Continued

Species: To be favored in existing stands	Species: Suitable for planting or seeding	Site quality
Yellow-poplar, red oak, ash, sugar maple, Virginia pine.	Yellow-poplar, larch, Virginia pine, Norway spruce, white pine.	Good.
Yellow-poplar, red oak, ash, sugar maple, Virginia pine.	Yellow-poplar, larch, Virginia pine, Norway spruce, white pine.	Good.
Yellow-poplar, red oak, ash, sugar maple, Virginia pine.	Yellow-poplar, larch, Virginia pine, Norway spruce, white pine.	Good.
Yellow-poplar, red oak, ash, sugar maple, red maple, Virginia pine.	Yellow-poplar, larch, Virginia pine, Norway spruce, white pine.	Good.
Yellow-poplar, red oak, ash, sugar maple, red maple, Virginia pine.	Yellow-poplar, larch, Virginia pine, Norway spruce, white pine.	Good.
Yellow-poplar, red oak, ash, sugar maple, red maple, Virginia pine.	Yellow-poplar, larch, Virginia pine, Norway spruce,	Good.
Black oak, chestnut oak, pitch pine	Virginia pine, pitch pine	Poor.
Red oak, black oak, Virginia pine, white pine	Larch, Virginia pine, white pine	Fair.
Red maple, sycamore, pin oak	White pine, white spruce	Poor.
Yellow-poplar, red oak, ash, sugar maple	Yellow-poplar, Virginia pine, Norway spruce, white pine, larch.	Very good.
Yellow-poplar, ash, Virginia pine, red oak, sugar maple.	Yellow-poplar, Virginia pine, white pine, larch, Norway spruce.	Good.
Yellow-poplar, red oak, ash, sugar maple. Virginia pine.	Yellow-poplar, larch, Virginia pine, Norway spruce, white pine.	Good.
Yellow-poplar, red oak, ash, sugar maple, Virginia pine.	Yellow-poplar, larch, Virginia pine, Norway spruce, white pine.	Good.
Yellow-popular, red oak, sugar maple, black walnut, ash.	Yellow-poplar, larch, white pine, black walnut, Norway spruce.	Excellent.
Yellow-poplar, ash, red maple, red oak, sugar maple	Yellow-poplar, larch, Norway spruce, white pine	Very good.
Yellow-poplar, red oak, sugar maple, black walnut, ash, white pine.	Yellow-poplar, larch, white pine, black walnut, Norway spruce.	Excellent.
Yellow-poplar, red oak, sugar maple, black walnut, ash, white pine.	Yellow-poplar, larch, white pine, black walnut, Norway spruce.	Excellent.
Red maple, sycamore, pin oak	White pine, white spruce	Fair.
Yellow-poplar, red oak, ash, sugar maple, Virginia pine.	Yellow-poplar, larch, Virginia pine, Norway spruce, white pine.	Good
Yellow-poplar, red oak, ash, sugar maple, Virginia pine.	Yellow-poplar, larch, Virginia pine, Norway spruce, white pine.	Good.
Yellow-poplar, red oak, ash, sugar maple	Yellow-poplar, larch, Norway spruce, white pine	Very good.
Red oak, black oak, Virginia pine, white pine	Larch, Virginia pine, white pine	Good.
Red oak, black oak, Virginia pine, white pine	Larch, Virginia pine, white pine	Good.
Red maple, sycamore, pin oak	White pine, white spruce	Poor.
Red oak, black oak, chestnut oak, Virginia pine	Larch, Virginia pine, white pine	Fair.
Red oak, black oak, chestnut oak, Virginia pine	Larch, Virginia pine, white pine	Fair.
Red oak, black oak, chestnut oak, Virginia pine	Larch, Virginia pine, white pine	Fair.
Black oak, chestnut oak, Virginia pine	Virginia pine, pitch pine	Poor.
Black oak, chestnut oak, Virginia pine	Virginia pine, pitch pine	Poor.

Cottontail rabbits are abundant throughout the county, and their numbers appear to be increasing. Although their distribution seems unrelated to soils, the largest populations are associated with the better farming areas.

Ruffed grouse are limited to the mountainous areas of Franklin County, especially where cherries and grapes are abundant. The largest population occurs in the southeastern corner and in the western part along Path Valley and Horse Valley.

Gray squirrels are abundant where woodlots produce good mast. A good population of fox squirrels inhabits the valley between Tuscarora and Cove Mountains in the southwestern corner of the county.

Mourning dove populations are high in the orchard country and in areas of natural eastern redcedar reproduction (fig. 18) near Greencastle and Williamson. The cedar stands and orchards furnish roosting cover, and the birds feed on the adjacent farmlands. The distribution of doves seems to correspond with the Hagerstown-Duffield soil association.

Mallards and wood ducks are the most common and numerous species of waterfowl. Greatest populations occur on the Conococheague Creek, Conodoquinet Creek, Fannettsburg Dam, Licking Creek, Back Creek, and Little Cove Creek.

Muskrat and mink occur along most waterways and farm ponds, especially in the farm areas of the county. Small colonies of beaver are on the West Branch of Conococheague Creek north of Fort Loudon and on Licking Creek.

Raccoon, woodchucks, skunks, opossum, and fox are abundant throughout the county.

Managing the soils for wildlife

All the soils in the county are suitable for some kinds of wildlife. Many practices that are used primarily to improve the soils and to increase crop production also benefit wildlife. Contour stripcropping and a crop rotation provide a mixture of cover and increase the amount of food and cover that wildlife can use. During winter, cover crops and crop residue are used by wildlife for food and cover. Diversion terraces and grassed waterways provide travel lanes and nesting places. Food and cover for wildlife are increased by fertilization and liming.

Figure 18.—Typical landscape in the Hagerstown-Duffield soil association provides cover and habitat for mourning doves.

Practices used primarily to benefit wildlife supplement the practices used mainly to increase crop yields. Grasses and legumes planted along field borders provide nesting places and food for wildlife. Hedgerows planted on cropland furnish travel lanes, food, and cover and also fence the field and protect the soils to some extent. Small patches of corn, small grains, and soybeans that are planted to supply food for wildlife are particularly valuable in abandoned or idle areas, especially if these patches are located near good cover or between wooded areas and open fields.

Habitat for wetland wildlife can be created or improved by constructing ponds in pastures or by constructing shallow-water impoundments in marshy areas and special structures for water control. The ponds can be stocked with fish, and they will be used by migratory waterfowl as resting places. If shrubs and trees are planted around these ponds, they attract many other kinds of wildlife. Shallow impoundments are used as breeding grounds and feeding areas for waterfowl and shorebirds. Muskrat, mink, and other furbearers also benefit from these developments. Because many of the soils in the county have limitations as sites for ponds, the sites should be selected with care before a pond is planned.

The greatest danger to fish in the waters of the county is from pollution and erosion sediments. Fish are killed by industrial waste, sewage, insecticides, and herbicides. Soil erosion is particularly damaging. As sediments are washed into streams, they settle and cover spawning beds and recently hatched fish. The sediments destroy food and food-producing areas. By filling pools, sediments cause water temperature to rise to a point that is harmful to fish. Erosion of streambanks is particularly damaging. This erosion is commonly caused by overgrazing, which should be controlled. Streambanks can also be protected by plantings, but the entire watershed should be protected by carrying out a complete plan that protects every farm and all of the land in the watershed.

In table 4 the soils of the county are rated according to their suitability for six kinds of wildlife food and cover, two kinds of water developments, and three groups of wildlife (*1*). The categories rated in table 4 are described in the paragraphs that follow.

Grain and seed crops are domestic grains or seed-producing annual herbaceous plants that are planted to produce food for wildlife. Examples are corn, sorghum, wheat, millet, buckwheat, soybeans, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted to furnish food and cover for wildlife. Examples are fescue, brome, bluegrass, timothy, redtop, orchardgrass, reed canarygrass, clover, trefoil, alfalfa, and sericea lespedeza.

Wild herbaceous upland plants are native or introduced perennial grasses or forbs that generally are established naturally and that provide food and cover mainly for upland wildlife. Examples are ragweed, wheatgrass, wildrye, oatgrass, pokeweed, strawberry, beggarweed, goldenrod, and dandelion.

Hardwood woody plants are deciduous trees, shrubs, and woody vines that produce fruit, nuts, buds, catkins, twigs, or foliage that is used extensively as food by wildlife, and that commonly is established naturally but also may be planted. Examples are oak, beech, cherry, hawthorn, dogwood, viburnum, holly, maple, birch, and poplar. Smaller plants include grape, honeysuckle, blueberry, brier, greenbrier, raspberry, and rose.

Coniferous woody plants are cone-bearing trees and shrubs that are important to wildlife mainly as cover, but that also furnish food in the form of browse, seeds, or cones. These trees and shrubs are commonly established naturally, but they also may be planted. Examples are pine, spruce, whitecedar, hemlock, fir, redcedar, juniper, and yew.

Wetland food and cover plants are annual and perennial grasses and grasslike plants on moist to wet sites. These plants do not include submerged or floating aquatic plants that produce the food and cover used mainly by wetland wildlife. Examples of wetland food plants are smartweed, wild millet, bulrush, sedges, wild rice, switchgrass, reed canarygrass, and cattails.

Shallow-water developments are areas of shallow water, 6 to 18 inches deep, that have been made by building low dikes or levees, by digging shallow excavations, or by using devices to control the water of marshy streams or channels.

Excavated ponds are dugout areas or a combination of dugout areas and low dikes that hold water of suitable quality, suitable depth, and in ample supply for the production of fish or wildlife. Such a pond should have a surface area of at least one-fourth acre and an average depth of 8 to 10 feet over at least one-fourth of the area. Also required is a water table that is permanently high or another source of unpolluted water of low acidity.

Openland wildlife are birds and mammals commonly found in crop fields, in meadows and pastures, and in areas of nonforested, overgrown land. Examples are bobwhite quail, ring-necked pheasants, mourning doves, woodcocks, cottontail rabbits, meadowlarks, killdeer, and field sparrows.

Woodland wildlife are birds and mammals commonly found in wooded areas. Examples are ruffed grouse, wild turkeys, deer, squirrels, raccoons, wood thrushes, warblers, and vireos.

Wetland wildlife are birds and mammals commonly found in marshes and swamps. Examples are ducks, geese, herons, snipes, rails, coots, muskrats, mink, and beavers.

Each rating under "Kinds of wildlife" in table 4 is based on the ratings listed for the habitat elements in the first part of the table. For openland wildlife the rating is based on the ratings shown for grain and seed crops, grasses and legumes, wild herbaceous upland plants, hardwood woody plants, and coniferous woody plants. The rating for woodland wildlife is based on the ratings listed for grasses and legumes, wild herbaceous upland plants, hardwood woody plants, and coniferous woody plants. For wetland wildlife the rating is based on the ratings shown for wetland food and cover plants, shallow-water developments, and excavated ponds.

Use of the Soils for Community Development

The information in this section is presented as general guidance of officials and developers who are concerned with selecting suitable uses for soils and avoiding mistakes and costly changes in plans. It is emphasized, however, that the mapping and written information are restricted in detail by the map scale and should be used only in planning more detailed field investigations to determine the in-place conditions of the soil at any specific site.

Table 5 shows the degree and kind of limitations of all the soils of Franklin County for use in community development. Soil limitations are indicated by the ratings slight, moderate, and severe. A rating of *slight* means that soil properties are generally favorable for the rated use and that limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable, but can be overcome or modified by special planning and design. A rating of *severe* means that soil properties are so unfavorable and limitations are so difficult to correct or overcome that major soil reclamation, special design, or intensive maintenance are needed. The degree of limitation is based on soil features that control the ease or difficulty of making improvements. Location and other economic features that often enter into decisions on land use were not considered.

The uses considered and the soil features evaluated in setting the degree of limitation are as follows:

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distributes effluent from a septic tank into natural soil. The soil material between depths of 18 inches and 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or rock, and susceptibility to flooding. Slope is a soil property that affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor and has sides, or embankments, of compacted soil material. The assumption is made that the embankment is compacted to medium density and the pond is protected from flooding. Properties are considered that affect the pond floor and the embankment. Those that affect the pond floor are permeability, organic-matter content, and slope. If the floor needs to be leveled, depth to and condition of bedrock become important. The soil properties that affect the embankment are the engineering properties of the embankment material as interpreted from the Unified Soil Classification and stoniness that influences ease of excavation and compaction of the embankment material.

Sites for homes of 3 stories or less and basements, as rated in table 5, are for buildings supported by foundation footings placed in undisturbed soil. Important soil features are those that relate to capacity to support load and resist settlement under load and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to

TABLE 4.—*Soil suitability*

Soils and map symbols	Wildlife habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants
Allegheny: AlB	Suited	Well suited	Well suited	Well suited
Alluvial land: Am	Poorly suited	Suited	Suited	Suited
Andover:				
AnB	Not suited	Poorly suited	Poorly suited	Suited
AoB	Poorly suited	Suited	Suited	Suited
Atkins and Melvin: As	Poorly suited	Suited	Suited	Suited
Atkins clayey subsoil variant: At	Poorly suited	Suited	Suited	Suited
Bedington: BcB, BcC	Suited	Well suited	Well suited	Well suited
Bedington-Laidig:				
BdB	Suited	Well suited	Well suited	Well suited
BdD	Poorly suited	Suited	Well suited	Well suited
Berks: BeB, BeC	Suited	Well suited	Well suited	Suited
Blairton:				
BlA	Well suited	Well suited	Well suited	Well suited
BlB	Suited	Well suited	Well suited	Well suited
Brinkerton:				
BrA	Poorly suited	Suited	Suited	Suited
BrB	Poorly suited	Suited	Suited	Suited
Buchanan:				
BuB, BuC	Suited	Well suited	Well suited	Well suited
BxB, BxD	Not suited	Not suited	Poorly suited	Poorly suited
Clarksburg: Ck	Well suited	Well suited	Well suited	Well suited
Dekalb and Hazleton: DeB, DeD	Not suited	Not suited	Poorly suited	Poorly suited
Dekalb and Lehew: DlF	Not suited	Not suited	Poorly suited	Poorly suited
Duffield:				
DsA	Well suited	Well suited	Well suited	Well suited
DsB, DsC, DsC3	Suited	Well suited	Well suited	Well suited
Dunning: Du	Not suited	Poorly suited	Poorly suited	Poorly suited
Dunning overwash variant: Dv	Not suited	Poorly suited	Poorly suited	Poorly suited
Edgemont:				
EcB, EcC	Suited	Well suited	Well suited	Well suited
EdC	Not suited	Not suited	Poorly suited	Poorly suited
Edom: EeB, EeC	Suited	Well suited	Well suited	Suited
Edom moderately well drained variant: ElB	Suited	Well suited	Well suited	Suited
Glenville: GlB	Suited	Well suited	Well suited	Well suited
Hagerstown:				
HeA	Well suited	Well suited	Well suited	Well suited
HeB, HeC	Suited	Well suited	Well suited	Well suited
HfB	Suited	Suited	Suited	Well suited
HgB3, HgC3	Poorly suited	Suited	Well suited	Well suited
HhC3	Suited	Suited	Suited	Well suited
HhD3	Poorly suited	Suited	Suited	Well suited
Hagerstown-Rock outcrop: HkB, HkD	Not suited	Poorly suited	Poorly suited	Suited
Highfield:				
HlB, HlC	Suited	Well suited	Well suited	Well suited
HmD, HmF	Not suited	Not suited	Poorly suited	Poorly suited
Laidig:				
LaB, LaD, LaE	Not suited	Not suited	Poorly suited	Poorly suited
LdB, LdC	Suited	Well suited	Well suited	Well suited
Leetonia: LeB	Not suited	Not suited	Poorly suited	Not suited
Lehew: LhD	Not suited	Not suited	Poorly suited	Poorly suited
Markes: MaB	Poorly suited	Suited	Suited	Suited
Meckesville: McD	Not suited	Not suited	Poorly suited	Poorly suited
Monongahela: MoB	Suited	Well suited	Well suited	Well suited
Murrill:				
MrB, MrC, MuB, MuC	Suited	Well suited	Well suited	Well suited
MvB, MvD	Not suited	Not suited	Poorly suited	Poorly suited
MwA	Well suited	Well suited	Well suited	Well suited
MwB, MwC	Suited	Well suited	Well suited	Well suited
Nolin: No	Suited	Well suited	Well suited	Well suited
Penlaw: Pe	Suited	Suited	Well suited	Well suited
Philo: Ph	Suited	Well suited	Well suited	Well suited
Pope: Po	Suited	Well suited	Well suited	Well suited
Purdy: Pu	Poorly suited	Suited	Suited	Suited
Ryder:				
RyB, RyC	Suited	Well suited	Well suited	Well suited
RyD	Poorly suited	Suited	Well suited	Well suited
Tyler: Ty	Suited	Suited	Well suited	Well suited
Urban land: Ur. Generally not suitable. Onsite investigation needed.				
Vanderlip:				
VaD	Poorly suited	Suited	Suited	Poorly suited
VaE	Well suited	Poorly suited	Suited	Poorly suited
Very stony land, Dekalb soil material: Vd	Not suited	Not suited	Not suited	Not suited
Warners: Wa	Not suited	Poorly suited	Poorly suited	Poorly suited
Weikert: WeB, WeC, WeD, WeF, WkB3, WkC3, WkD3	Not suited	Poorly suited	Poorly suited	Not suited

for wildlife habitat

Wildlife habitat elements—Continued				Kinds of wildlife		
Coniferous woody plants	Wetland food and cover plants	Shallow-water developments	Excavated ponds	Openland	Woodland	Wetland
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Suited	Suited	Poorly suited	Poorly suited	Suited	Suited	Poorly suited.
Suited	Poorly suited	Not suited	Not suited	Poorly suited	Suited	Not suited.
Suited	Suited	Not suited	Not suited	Suited	Suited	Not suited.
Suited	Poorly suited	Suited	Suited	Poorly suited	Suited	Suited.
Suited	Poorly suited	Suited	Suited	Poorly suited	Suited	Suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Suited	Well suited	Not suited.
Suited	Not suited	Not suited	Not suited	Well suited	Suited	Not suited.
Well suited	Poorly suited	Poorly suited	Poorly suited	Well suited	Well suited	Suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Suited	Well suited	Well suited	Well suited	Suited	Suited	Well suited.
Suited	Suited	Not suited	Not suited	Suited	Suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Not suited	Poorly suited	Not suited.
Well suited	Poorly suited	Poorly suited	Poorly suited	Well suited	Well suited	Suited.
Poorly suited	Not suited	Not suited	Not suited	Not suited	Poorly suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Not suited	Poorly suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Poorly suited	Suited	Well suited	Poorly suited	Poorly suited	Suited.
Poorly suited	Poorly suited	Suited	Well suited	Poorly suited	Poorly suited	Suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Not suited	Poorly suited	Not suited.
Suited	Not suited	Not suited	Not suited	Well suited	Suited	Not suited.
Suited	Not suited	Not suited	Not suited	Well suited	Suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Suited	Well suited	Not suited.
Suited	Not suited	Not suited	Not suited	Poorly suited	Suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Not suited	Poorly suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Not suited	Poorly suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Not suited	Not suited	Not suited	Not suited	Poorly suited	Not suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Not suited	Poorly suited	Not suited.
Suited	Well suited	Not suited	Not suited	Suited	Suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Not suited	Poorly suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Not suited	Not suited	Poorly suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Well suited	Suited	Suited	Suited	Well suited	Well suited	Suited.
Well suited	Poorly suited	Poorly suited	Poorly suited	Well suited	Well suited	Suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Suited	Well suited	Well suited	Well suited	Suited	Suited	Well suited.
Well suited	Not suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Not suited	Suited	Well suited	Not suited.
Well suited	Suited	Suited	Suited	Well suited	Well suited	Suited.
Poorly suited	Not suited	Not suited	Not suited	Suited	Poorly suited	Well suited.
Poorly suited	Not suited	Not suited	Not suited	Poorly suited	Poorly suited	Not suited.
Not suited	Not suited	Not suited	Not suited	Not suited	Not suited	Not suited.
Poorly suited	Poorly suited	Suited	Suited	Poorly suited	Poorly suited	Suited.
Not suited	Not suited	Not suited	Not suited	Poorly suited	Not suited	Not suited.

TABLE 5.—*Soil limitations*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil that series that appear

Soils and map symbols	Septic tank absorption fields	Sewage lagoons
Allegheny: AlB	Slight	Moderate: moderate permeability; slope.
Alluvial land: Am	Severe: subject to flooding	Severe: subject to flooding
Andover:		
AnB	Severe: high water table; slow permeability.	Moderate: high water table; slope; gravelly material; stoniness.
AoB	Severe: high water table; slow permeability.	Moderate: slope; gravelly material.
*Atkins and Melvin: As. Rating applies to both Atkins and Melvin soils.	Severe: subject to flooding; high water table; slow permeability.	Severe: subject to flooding
Atkins clayey subsoil variant: At	Severe: subject to flooding; high water table; moderately slow permeability.	Severe: subject to flooding
Bedington:		
BcB	Slight	Severe: moderate to moderately rapid permeability.
BcC	Moderate: slope	Severe: moderate to moderately rapid permeability.
*Bedington-Laidig:		
BdB. For the Bedington part, see BcC in the Bedington series; for the Laidig part, see LdB in the Laidig series.		
BdD	Severe: slope	Severe: moderate to moderately rapid permeability; slope.
Berks:		
BeB	Severe: bedrock at a depth of 1½ to 3½ feet.	Severe: moderate to rapid permeability; bedrock at a depth of 1½ to 3½ feet.
BeC	Severe: bedrock at a depth of 1½ to 3½ feet.	Severe: moderate to rapid permeability; bedrock at a depth of 1½ to 3½ feet; slope.
Blairton: BlA, BlB	Severe: seasonal high water table; moderately slow to moderate permeability; bedrock at a depth of 1½ to 3½ feet.	Severe: bedrock at a depth of 1½ to 3½ feet.
Brinkerton:		
BrA	Severe: high water table; slow permeability.	Slight
BrB	Severe: high water table; slow permeability.	Moderate: slope
Buchanan:		
BuB	Severe: seasonal high water table; slow permeability.	Moderate: slope; gravelly material.
BuC	Severe: seasonal high water table; slow permeability.	Severe: slope
BxB	Severe: seasonal high water table; slow permeability.	Severe: stoniness

See footnote at end of table.

for community development

may have different properties and limitations. It is necessary, therefore, to follow carefully the instructions for referring to other in the first column]

Sites for homes of 3 stories or less and basements	Lawns and landscaping	Streets and parking lots for subdivisions	Trench method sanitary landfills [1]	Cemeteries
Slight	Slight	Moderate: slope	Moderate if bedrock at a depth of 4 to 5 feet, slight if 5 to 10 feet or more.	Slight.
Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Severe: subject to flooding; high water table.	Severe: subject to flooding; high water table.	Severe: subject to flooding; high water table.	Severe: subject to flooding; high water table.	Severe: subject to flooding; high water table.
Severe: subject to flooding; high water table.	Severe: subject to flooding; high water table.	Severe: subject to flooding; high water table.	Severe: subject to flooding; high water table.	Severe: subject to flooding; high water table.
Slight	Slight	Moderate: slope	Severe: moderate to moderately rapid permeability.	Slight.
Moderate: slope	Moderate: slope	Severe: slope	Severe: moderate to moderately rapid permeability.	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: moderate to moderately rapid permeability; slope.	Severe: slope.
Moderate: bedrock at a depth of 1½ to 3½ feet.	Moderate: bedrock at a depth of 1½ to 3½ feet.	Moderate: slope	Severe: bedrock at a depth of 1½ to 3½ feet.	Moderate: bedrock at a depth of 1½ to 3½ feet.
Moderate: bedrock at a depth of 1½ to 3½ feet; slope.	Moderate: bedrock at a depth of 1½ to 3½ feet; slope.	Severe: slope	Severe: bedrock at a depth of 1½ to 3½ feet.	Moderate: bedrock at a depth of 1½ to 3½ feet; slope.
Severe: seasonal high water table.	Moderate: seasonal high water table; bedrock at a depth of 1½ to 3½ feet.	Moderate: seasonal high water table.	Severe: seasonal high water table; bedrock at a depth of 1½ to 3½ feet.	Severe: seasonal high water table.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slope.	Severe: seasonal high water table.	Severe: seasonal high water table.
Severe: seasonal high water table; slope.	Moderate: seasonal high water table; slope.	Severe: slope	Severe: seasonal high water table.	Severe: seasonal high water table.
Severe: stoniness	Severe: stoniness	Moderate: slope; stoniness.	Severe: seasonal high water table; stoniness.	Severe: seasonal high water table; stoniness.

TABLE 5.—*Soil limitations for*

Soils and map symbols	Septic tank absorption fields	Sewage lagoons
BxD	Severe: seasonal high water table; slow permeability; slope.	Severe: slope; stoniness
Clarksburg: Ck	Severe: seasonal high water table; slow permeability.	Slight
*Dekalb and Hazleton: Ratings apply to both soils.		
DeB	Severe if bedrock at a depth of 1½ to 3½ feet, moderate if 3½ to 5 feet, slight if 5 to 6 feet.	Severe: rapid to moderately rapid permeability; bedrock at a depth of 1½ to 6 feet.
DeD	Severe: bedrock at a depth of 1½ to 6 feet; slope.	Severe: rapid to moderately rapid permeability; bedrock at a depth of 1½ to 6 feet; slope.
*Dekalb and Lehew: Ratings apply to both soils.		
DlF	Severe: bedrock at a depth of 1½ to 3½ feet; slope.	Severe: moderate to rapid permeability; bedrock at a depth of 1½ to 3½ feet; slope.
Duffield:		
DsA	Slight: hazard of ground water contamination.	Moderate: moderate permeability; hazard of ground water contamination.
DsB	Slight: hazard of ground water contamination.	Moderate: moderate permeability; hazard of ground water contamination; slope.
DsC	Moderate: hazard of ground water contamination; slope.	Severe: slope
DsC3	Moderate: hazard of ground water contamination; slope.	Severe: slope
Dunning: Du	Severe: high water table; slow permeability; subject to flooding.	Severe: subject to flooding
Dunning overwash variant: Dv	Severe: seasonal high water table; subject to flooding.	Severe: subject to flooding
Edgemont:		
EcB	Moderate: if bedrock at a depth of 3½ to 5 feet, slight if 5 to 6 feet.	Severe: moderate to moderately rapid permeability.
EcC	Moderate: bedrock at a depth of 3½ to 5 feet; slope.	Severe: moderate to moderately rapid permeability; slope.
EdC	Moderate: slope; stoniness	Severe: moderate to moderately rapid permeability; slope.
Edom:		
EeB	Moderate: moderate permeability; bedrock at a depth of 3½ to 5 feet or more.	Moderate: bedrock at a depth of 3½ to 5 feet or more; moderate permeability; slope.
EeC	Moderate: moderate permeability; bedrock at a depth of 3½ to 5 feet or more; slope.	Severe: slope

See footnote at end of table.

community development—Continued

Sites for homes of 3 stories or less and basements	Lawns and landscaping	Streets and parking lots for subdivisions	Trench method sanitary landfills [1]	Cemeteries
Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: seasonal high water table; slope; stoniness.	Severe: seasonal high water table; slope; stoniness.
Moderate: seasonal high water table.	Slight	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Severe if bedrock at a depth of 1½ to 3½ feet, moderate if 3½ to 5 feet, slight if 5 to 6 feet: stoniness.	Severe: stoniness	Moderate: bedrock at a depth of 1½ to 6 feet; slope; stoniness.	Severe: moderately rapid to rapid permeability; bedrock at a depth of 1½ to 6 feet.	Severe: bedrock at a depth of 1½ to 6 feet; stoniness.
Severe: bedrock at a depth of 1½ to 6 feet; slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: rapid to moderately rapid permeability; bedrock at a depth of 1½ to 6 feet.	Severe: bedrock at a depth of 1½ to 6 feet; slope; stoniness.
Severe: bedrock at a depth of 1½ to 3½ feet; slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: moderate to rapid permeability; bedrock at a depth of 1½ to 3½ feet; slope.	Severe: slope; stoniness.
Slight	Slight	Slight	Slight: underlain by sinkholes and solution caverns.	Slight.
Slight	Slight	Moderate: slope	Slight: underlain by sinkholes and solution caverns.	Slight.
Moderate: slope	Moderate: slope	Severe: slope	Moderate: underlain by sinkholes and solution caverns; slope.	Moderate: slope.
Moderate: slope	Severe: eroded	Severe: slope	Moderate: underlain by sinkholes and solution caverns; slope.	Moderate: slope.
Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.
Severe: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Severe: seasonal high water table; subject to flooding.	Severe: subject to flooding.
Moderate if bedrock at a depth of 3½ to 5 feet, slight if 5 to 6 feet.	Slight	Moderate: slope	Severe: bedrock at a depth of 3½ to 6 feet; moderate to moderately rapid permeability.	Moderate: bedrock at a depth of 3½ to 6 feet.
Moderate: bedrock at a depth of 3½ to 5 feet; slope.	Moderate: slope	Severe: slope	Severe: bedrock at a depth of 3½ to 6 feet.	Moderate: bedrock at a depth of 3½ to 6 feet; slope.
Severe: slope; stoniness.	Severe: stoniness	Severe: slope	Severe: bedrock at a depth of 3½ to 6 feet; stoniness.	Severe: stoniness.
Moderate if bedrock at a depth of 3½ to 5 feet, slight if more than 5 feet.	Moderate: surface texture.	Moderate: slope	Severe: bedrock at a depth of 3½ to 5 feet or more	Moderate: bedrock at a depth of 3½ to 5 feet or more.
Moderate: bedrock at a depth of 3½ to 5 feet or more; slope.	Moderate: surface texture; slope.	Severe: slope	Severe: bedrock at a depth of 3½ to 5 feet or more.	Moderate: bedrock at a depth of 3½ to 5 feet or more; slope.

TABLE 5.—*Soil limitations for*

Soils and map symbols	Septic tank absorption fields	Sewage lagoons
Edom moderately well drained variant: EIB	Severe: seasonal high water table; slow permeability.	Moderate: bedrock at a depth of 3½ to 5 feet or more; slope.
Glenville: GIB	Severe: seasonal high water table; moderately slow permeability.	Moderate: bedrock at a depth of 4 to 6 feet.
Hagerstown:		
HeA	Moderate if bedrock at a depth of 3½ to 5 feet, slight if more than 5 feet: hazard of ground water contamination.	Moderate: moderate permeability; bedrock at a depth of 3½ feet or more; hazard of ground water combination.
HeB	Moderate if bedrock at a depth of 3½ to 5 feet, slight if more than 5 feet: hazard of ground water contamination.	Moderate: moderate permeability; bedrock at a depth of 3½ feet or more; hazard of ground water contamination; slope.
HeC	Moderate: bedrock at a depth of 3½ feet or more; hazard of ground water contamination; slope.	Severe: slope; hazard of ground water contamination.
HfB	Moderate if bedrock at a depth of 3½ to 5 feet, slight if more than 5 feet: hazard of ground water contamination.	Moderate: moderate permeability; bedrock at a depth of 3½ feet or more; hazard of ground water contamination; slope.
HgB3	Moderate if bedrock at a depth of 3½ to 5 feet, slight if more than 5 feet: hazard of ground water contamination; rockiness.	Moderate: moderate permeability; bedrock at a depth of 3½ feet or more; hazard of ground water contamination; slope; rockiness.
HgC3	Moderate: bedrock at a depth of 3½ feet or more; hazard of ground water contamination; slope; rockiness.	Severe: slope
HhC3	Moderate: bedrock at a depth of 3½ feet or more; hazard of ground water contamination; slope.	Severe: slope
HhD3	Severe: slope	Severe: slope
*Hagerstown-Rock outcrop:		
HkB. For the Hagerstown part, see HfB in the Hagerstown series. Rating for Rock outcrop is severe.		
HkD	Severe: hazard of ground water contamination; slope.	Severe: slope

See footnote at end of table.

community development—Continued

Sites for homes of 3 stories or less and basements	Lawns and landscaping	Streets and parking lots for subdivisions	Trench method sanitary landfills [1]	Cemeteries
Moderate: seasonal high water table; bedrock at a depth of 3½ to 5 feet or more.	Moderate: surface texture.	Moderate: seasonal high water table; slope.	Severe: seasonal high water table; bedrock at a depth of 3½ to 5 feet or more.	Moderate: seasonal high water table; bedrock at a depth of 3½ to 5 feet or more.
Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slope.	Severe: seasonal high water table; bedrock at a depth of 4 to 6 feet.	Severe: seasonal high water table.
Moderate if bedrock at a depth of 3½ to 5 feet, slight if more than 5 feet: underlain by sinkholes and solution caverns.	Slight	Slight	Severe: bedrock at a depth of 3½ to 7 feet or more; underlain by sinkholes and solution caverns.	Moderate: bedrock at a depth of 3½ to 7 feet or more.
Moderate if bedrock at a depth of 3½ to 5 feet, slight if more than 5 feet: underlain by sinkholes and solution caverns.	Slight	Moderate: slope	Severe: bedrock at a depth of 3½ to 7 feet or more; underlain by sinkholes and solution caverns.	Moderate: bedrock at a depth of 3½ to 7 feet or more.
Moderate: bedrock at a depth of 3½ feet or more; underlain by sinkholes and solution caverns.	Moderate: slope	Severe: slope	Severe: bedrock at a depth of 3½ to 7 feet or more; underlain by sinkholes and solution caverns.	Moderate: bedrock at a depth of 3½ to 7 feet or more; slope.
Moderate: bedrock at a depth of 3½ feet or more; texture; underlain by sinkholes and solution caverns.	Moderate: surface texture.	Moderate: slope	Severe: bedrock at a depth of 3½ to 7 feet or more; underlain by sinkholes and solution caverns.	Moderate: bedrock at a depth of 3½ to 7 feet or more.
Moderate: bedrock at a depth of 3½ feet or more; texture; underlain by sinkholes and solution caverns; rockiness.	Moderate: surface texture; rockiness; eroded.	Moderate: slope; rockiness.	Severe: bedrock at a depth of 3½ to 7 feet or more; underlain by sinkholes and solution caverns; rockiness.	Severe: rockiness.
Moderate: bedrock at a depth of 3½ feet or more; underlain by sinkholes and solution caverns; slope; texture; rockiness.	Severe: eroded	Severe: slope	Severe: bedrock at a depth of 3½ to 7 feet or more; underlain by sinkholes and solution caverns; rockiness.	Severe: rockiness.
Moderate: bedrock at a depth of 3½ feet or more; underlain by sinkholes and solution caverns; slope; texture.	Severe: surface texture; eroded.	Severe: slope	Severe: bedrock at a depth of 3½ to 7 feet or more; underlain by sinkholes and solution caverns; texture.	Severe: surface texture.
Severe: underlain by sinkholes and solution caverns; slope.	Severe: surface texture; slope; eroded.	Severe: slope	Severe: bedrock at a depth of 3½ to 7 feet or more; underlain by sinkholes and solution caverns; texture; slope.	Severe: surface texture; slope.
Severe: underlain by sinkholes and solution caverns; slope; rockiness.	Severe: slope	Severe: slope; rockiness.	Severe: bedrock at a depth of 3½ to 7 feet or more; underlain by sinkholes and solution caverns; slope; rockiness.	Severe: slope; rockiness.

TABLE 5.—*Soil limitations for*

Soils and map symbols	Septic tank absorption fields	Sewage lagoons
Hazleton: Mapped only with Dekalb soils.		
Highfield:		
HlB	Moderate if bedrock at a depth of 3½ to 5 feet, slight if 5 to 6 feet.	Moderate: moderate permeability; bedrock at a depth of 3½ to 6 feet; slope.
HlC	Moderate: bedrock at a depth of 3½ to 6 feet; slope.	Severe: slope
HmD	Severe: slope	Severe: slope; stoniness
HmF	Severe: slope	Severe: slope; stoniness
Laidig:		
LaB	Severe: moderately slow permeability.	Severe: stoniness
LaD, LaE	Severe: moderately slow permeability; slope.	Severe: slope; stoniness
LdB	Severe: moderately slow permeability.	Moderate: slope; gravelly material.
LdC	Severe: moderately slow permeability.	Severe: slope
Leetonia: LeB	Severe: bedrock at a depth of 2½ to 3½ feet.	Severe: moderately rapid permeability; bedrock at a depth of 2½ to 3½ feet; stoniness.
Lehew: LhD	Severe: bedrock at a depth of 1½ to 3½ feet; slope.	Severe: moderate to rapid permeability; bedrock at a depth of 1½ to 3½ feet; slope; stoniness.
Markes: MaB	Severe: high water table; slow permeability; bedrock at a depth of 1½ to 3½ feet.	Severe: bedrock at a depth of 1½ to 3½ feet.
Meckesville: McD	Severe: moderately slow permeability; slope.	Severe: slope; stoniness
Melvin. Mapped only with Atkins soil.		
Monongahela: MoB	Severe: seasonal high water table; slow permeability.	Moderate: slope
Murrill:		
MrB	Slight: hazard of ground water contamination.	Moderate: moderate permeability; hazard of ground water contamination; slope; gravelly material.
MrC	Moderate: hazard of ground water contamination; slope.	Severe: hazard of ground water contamination; slope.
MuB	Slight: hazard of ground water contamination.	Moderate: moderate permeability; hazard of ground water contamination; slope; cobbly material.
MuC	Moderate: hazard of ground water contamination; slope.	Severe: slope

See footnote at end of table.

community development—Continued

Sites for homes of 3 stories or less and basements	Lawns and landscaping	Streets and parking lots for subdivisions	Trench method sanitary landfills [1]	Cemeteries
Moderate if bedrock at a depth of 3½ to 5 feet, slight if 5 to 6 feet.	Slight	Moderate: slope	Severe: bedrock at a depth of 3½ to 6 feet.	Moderate: bedrock at a depth of 3½ to 6 feet.
Moderate: bedrock at a depth of 3½ to 6 feet; slope.	Moderate: slope	Severe: slope	Severe: bedrock at a depth of 3½ to 6 feet.	Moderate: bedrock at a depth of 3½ to 6 feet; slope.
Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: bedrock at a depth of 3½ to 6 feet; stoniness.	Severe: slope; stoniness.
Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: bedrock at a depth of 3½ to 6 feet; slope; stoniness.	Severe: slope; stoniness.
Severe: stoniness	Severe: stoniness	Moderate: slope; stoniness.	Severe: stoniness	Severe: stoniness.
Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: slope; stoniness.	Severe: slope; stoniness.
Slight	Slight	Moderate: slope	Slight	Slight.
Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope.
Severe: bedrock at a depth of 2½ to 3½ feet; stoniness.	Severe: stoniness	Moderate: bedrock at a depth of 2½ to 3½ feet; stoniness.	Severe: bedrock at a depth of 2½ to 3½ feet; stoniness.	Severe: bedrock at a depth of 2½ to 3½ feet; stoniness.
Severe: bedrock at a depth of 1½ to 3½ feet; slope; stoniness.	Severe: stoniness	Severe: slope	Severe: bedrock at a depth of 1½ to 3½ feet; stoniness.	Severe: slope; stoniness.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table; bedrock at a depth of 1½ to 3½ feet.	Severe: high water table.
Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: stoniness	Severe: slope; stoniness.
Moderate: seasonal high water table.	Slight	Moderate: seasonal high water table; slope.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Slight: underlain by sinkholes and solution caverns.	Moderate: surface texture.	Moderate: underlain by sinkholes and solution caverns; slope.	Slight: underlain by sinkholes and solution caverns.	Slight.
Moderate: underlain by sinkholes and solution caverns; slope.	Moderate: surface texture; slope.	Severe: underlain by sinkholes and solution caverns; slope.	Moderate: underlain by sinkholes and solution caverns; slope.	Moderate: slope.
Slight: underlain by sinkholes and solution caverns.	Severe: cobbly material.	Moderate: underlain by sinkholes and solution caverns; slope.	Slight: underlain by sinkholes and solution caverns.	Severe: cobbly material.
Moderate: underlain by sinkholes and solution caverns; slope.	Severe: cobbly material.	Severe: underlain by sinkholes and solution caverns; slope.	Moderate: underlain by sinkholes and solution caverns; slope.	Severe: cobbly material.

TABLE 5.—*Soil limitations for*

Soils and map symbols	Septic tank absorption fields	Sewage lagoons
MvB	Moderate: hazard of ground water contamination; stoniness.	Severe: hazard of ground water contamination; stoniness.
MvD	Severe: hazard of ground water contamination; slope.	Severe: hazard of ground water contamination; slope; stoniness.
MwA	Slight: hazard of ground water contamination.	Moderate: hazard of ground water contamination; moderate permeability; gravelly material.
MwB	Slight: hazard of ground water contamination.	Moderate: hazard of ground water contamination; moderate permeability; slope; gravelly material.
MwC	Moderate: hazard of ground water contamination; slope.	Severe: slope
Nolin: No	Severe: subject to flooding	Severe: subject to flooding
Penlaw: Pe	Severe: seasonal high water table; slow permeability.	Moderate if bedrock at a depth of 3½ to 5 feet, slight if more than 5 feet.
Philo: Ph	Severe: seasonal high water table; moderate to moderately slow permeability; subject to flooding.	Severe: subject to flooding
Pope: Po	Severe: subject to flooding	Severe: moderately rapid permeability; subject to flooding.
Purdy: Pu	Severe: high water table; slow permeability.	Slight
Ryder:		
RyB	Severe: bedrock at a depth of 2 to 3½ feet.	Severe: moderate to moderately rapid permeability; bedrock at a depth of 2 to 3½ feet.
RyC	Severe: bedrock at a depth of 2 to 3½ feet.	Severe: moderate to moderately rapid permeability; bedrock at a depth of 2 to 3½ feet; slope.
RyD	Severe: bedrock at a depth of 2 to 3½ feet; slope.	Severe: moderate to moderately rapid permeability; bedrock at a depth of 2 to 3½ feet; slope.
Tyler: Ty	Severe: seasonal high water table; slow permeability.	Slight
Urban land: Ur. Too variable to rate; requires onsite investigation.		
Vanderlip: VaD, VaE	Severe: slope	Severe: rapid permeability; slope.
Very stony land, Dekalb soil material: Vd	Severe: bedrock at a depth of 1½ to 3½ feet; slope.	Severe: bedrock at a depth of 1½ to 3½ feet; slope; stoniness.
Warners: Wa	Severe: high water table; slow permeability; subject to flooding.	Severe: subject to flooding

See footnote at end of table.

community development—Continued

Sites for homes of 3 stories or less and basements	Lawns and landscaping	Streets and parking lots for subdivisions	Trench method sanitary landfills [1]	Cemeteries
Severe: underlain by sinkholes and solution caverns; stoniness.	Severe: stoniness	Moderate: underlain by sinkholes and solution caverns; slope; stoniness.	Severe: underlain by sinkholes and solution caverns; stoniness.	Severe: stoniness.
Severe: underlain by sinkholes and solution caverns; slope; stoniness.	Severe: slope; stoniness.	Severe: underlain by sinkholes and solution caverns; slope.	Severe: underlain by sinkholes and solution caverns; slope; stoniness.	Severe: slope; stoniness.
Slight: underlain by sinkholes and solution caverns.	Slight	Slight	Slight: underlain by sinkholes and solution caverns.	Slight.
Slight: underlain by sinkholes and solution caverns.	Slight	Moderate: underlain by sinkholes and solution caverns; slope.	Slight: underlain by sinkholes and solution caverns.	Slight.
Moderate: underlain by sinkholes and solution caverns; slope.	Moderate: slope	Severe: underlain by sinkholes and solution caverns; slope.	Moderate: underlain by sinkholes and solution caverns; slope.	Moderate: slope.
Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Severe: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Severe: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table; texture.	Severe: high water table.
Severe: bedrock at a depth of 2 to 3½ feet.	Moderate: bedrock at a depth of 2 to 3½ feet.	Moderate: bedrock at a depth of 2 to 3½ feet; slope.	Severe: bedrock at a depth of 2 to 3½ feet; moderate to moderately rapid permeability.	Severe: bedrock at a depth of 2 to 3½ feet.
Severe: bedrock at a depth of 2 to 3½ feet.	Moderate: bedrock at a depth of 2 to 3½ feet.	Severe: slope	Severe: moderate to moderately rapid permeability; bedrock at a depth of 2 to 3½ feet.	Severe: bedrock at a depth of 2 to 3½ feet.
Severe: bedrock at a depth of 2 to 3½ feet; slope.	Severe: slope	Severe: slope	Severe: bedrock at a depth of 2 to 3½ feet; moderate to moderately rapid permeability; slope.	Severe: bedrock at a depth of 2 to 3½ feet; slope.
Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Severe: slope	Severe: surface texture; cobbly material.	Severe: slope	Severe: rapid permeability; slope.	Severe: slope; cobbly material.
Severe: slope; stoniness.	Severe: stoniness	Severe: slope	Severe: bedrock at a depth of 1½ to 3½ feet; stoniness.	Severe: bedrock at a depth of 1½ to 3½ feet; stoniness.
Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.	Severe: high water table; subject to flooding.

TABLE 5.—*Soil limitations for*

Soils and map symbols	Septic tank absorption fields	Sewage lagoons
Weikert:		
WeB	Severe: bedrock at a depth of 1 to 1½ feet.	Severe: moderately rapid permeability; bedrock at a depth of 1 to 1½ feet.
WeC	Severe: bedrock at a depth of 1 to 1½ feet.	Severe: moderately rapid permeability; bedrock at a depth of 1 to 1½ feet; slope.
WeD	Severe: bedrock at a depth of 1 to 1½ feet; slope.	Severe: moderately rapid permeability; bedrock at a depth of 1 to 1½ feet; slope.
WeF	Severe: bedrock at a depth of 1 to 1½ feet; slope.	Severe: moderately rapid permeability; bedrock at a depth of 1 to 1½ feet; slope.
WkB3	Severe: bedrock at a depth of 1 to 1½ feet.	Severe: moderately rapid permeability; bedrock at a depth of 1 to 1½ feet; very shaly material.
WkC3	Severe: bedrock at a depth of 1 to 1½ feet.	Severe: moderately rapid permeability; bedrock at a depth of 1 to 1½ feet; slope; very shaly material.
WkD3	Severe: bedrock at a depth of 1 to 1½ feet; slope.	Severe: moderately rapid permeability; bedrock at a depth of 1 to 1½ feet; slope; very shaly material.

[1] Onsite study is needed of the underlying strata and water table to determine the hazards of aquifer pollution and drainage into ground water for landfill deeper than 5 or 6 feet.

community development—Continued

Sites for homes of 3 stories or less and basements	Lawns and landscaping	Streets and parking lots for subdivisions	Trench method sanitary landfills [1]	Cemeteries
Moderate: bedrock at a depth of 1 to 1½ feet.	Severe: bedrock at a depth of 1 to 1½ feet.	Moderate: bedrock at a depth of 1 to 1½ feet; slope.	Severe: bedrock at a depth of 1 to 1½ feet; moderately rapid permeability.	Severe: bedrock at a depth of 1 to 1½ feet.
Moderate: bedrock at a depth of 1 to 1½ feet; slope.	Severe: bedrock at a depth of 1 to 1½ feet.	Severe: slope	Severe: bedrock at a depth of 1 to 1½ feet; moderately rapid permeability.	Moderate: bedrock at a depth of 1 to 1½ feet; slope.
Severe: slope	Severe: bedrock at a depth of 1 to 1½ feet; slope.	Severe: slope	Severe: bedrock at a depth of 1 to 1½ feet; moderately rapid permeability; slope.	Severe: slope.
Severe: slope	Severe: bedrock at a depth of 1 to 1½ feet; slope.	Severe: slope	Severe: bedrock at a depth of 1 to 1½ feet; moderately rapid permeability; slope.	Severe: slope.
Moderate: bedrock at a depth of 1 to 1½ feet.	Severe: bedrock at a depth of 1 to 1½ feet; very shaly material.	Moderate: bedrock at a depth of 1 to 1½ feet; slope.	Severe: bedrock at a depth of 1 to 1½ feet; moderately rapid permeability.	Severe: very shaly material.
Moderate: bedrock at a depth of 1 to 1½ feet; slope.	Severe: bedrock at a depth of 1 to 1½ feet; slope; very shaly material; eroded.	Severe: slope	Severe: bedrock at a depth of 1 to 1½ feet; moderately rapid permeability.	Severe: very shaly material.
Severe: slope	Severe: bedrock at a depth of 1 to 1½feet; slope; very shaly material; eroded.	Severe: slope	Severe: bedrock at a depth of 1 to 1½ feet; moderately rapid permeability; slope.	Severe: slope; very shaly material.

flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

Lawns and landscaping require soil material in amounts sufficient for desirable trees and other plants to survive and grow. Among the factors considered are depth to seasonal high water table, slope, depth to bedrock, texture, presence of stones or rocks, and hazard of flooding. The need for lime and fertilizer was not considered in the ratings.

Streets and parking lots for subdivisions have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep.

Sanitary landfills are sites for disposing of refuse. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. Unless otherwise stated, the ratings in table 5 apply only to a depth of about 6 feet, and limitation ratings of *slight* or *moderate* may not be valid if trenches are to be much deeper than that. Although for some soils reliable predictions can be made to a depth of 10 or fifteen feet, every site should be investigated before it is selected.

Cemeteries are mainly affected by such soil properties as depth to bedrock, depth to seasonal high water table, hazard of flooding, rockiness, stoniness, and soil texture.

Use of the Soils for Recreational Development

Knowledge of soils is necessary in planning, developing, and maintaining areas for recreation. In table 6 the soils of Franklin County are rated according to limitations that affect their suitability for camp areas, playgrounds, picnic areas, and paths and trails.

In table 6 the soils are rated as having slight, moderate, or severe limitations for the specified uses. For all of these ratings, it is assumed that a good cover of vegetation can be established and maintained. A rating of *slight* means that soil properties are generally favorable and limitations are so minor that they can be easily overcome. A rating of *moderate* means limitations can be overcome or modified by planning, design, or special maintenance. A rating of *severe* means limitations can be overcome only by costly soil reclamation, special design, intense maintenance, or a combination of these.

Campsites are used intensively for tents and small camp trailers and the accompanying activities of outdoor living during the camping season, which normally extends from May 30 to Labor Day. Little preparation of the site is required, other than shaping and leveling for tent and parking areas. Camp areas are subject to heavy foot traffic and limited vehicular traffic. Desirable soil features are mild slopes, good drainage, a surface free of rocks and coarse fragments, freedom from flooding during periods of heavy use, and a surface that is firm after rain but not dusty when dry.

Service buildings without basements are used for washrooms, bathhouses, picnic shelters, and seasonal or year-round cottages in recreational areas. Suitable soils are at least moderately well drained, have slopes of less than 15 percent, and have few or no stones on the surface. Soil limitations for buildings with basements are shown in table 5.

Paths and trails in camping areas are used for local and cross-country travel on foot or horseback. Design and layout should require little or no cutting and filling. Suitable soils are at least moderately well drained, are firm when wet but not dusty when dry, are not subject to frequent flooding, have slopes of less than 15 percent, and have few or no rocks or stones on the surface.

Picnic and play areas are attractive natural or landscaped tracts used primarily for preparing meals and eating outdoors. These are subject to heavy foot traffic. Most of the vehicular traffic, however, is confined to access roads. Suitable soils are firm when wet but not dusty when dry, are free of flooding during the season of use, and do not have slopes or stones that greatly increase cost of leveling sites or building access roads.

Athletic fields are areas used intensively for baseball, football, badminton, and similar organized games. Soils suitable for this use need to withstand intensive foot traffic. Soils should have a nearly level surface free of coarse fragments and rock outcrops, good drainage, freedom from flooding during periods of heavy use, and a surface that is firm after rain but not dusty when dry. If grading and leveling are required, depth to rock is important.

Golf fairways are used for turf, shrubs, and trees without adding topsoil. Traps, roughs, and greens are specialized features not considered in ratings for golf fairways. Suitable soils are at least moderately well drained and have a nearly level or gently sloping surface free of coarse fragments and stones.

Use of the Soils for Engineering[5]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

[5]PETER PETRAS, civil engineer, Soil Conservation Service, helped prepare this section.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary site evaluations prior to detailed site investigations in a particular area.

Most of the information in this section is presented in tables 7, 8, and 9, which show, respectively, results of engineering laboratory tests on soil samples; several estimated soil properties significant to engineering; and interpretations of soil properties for various engineering uses.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 8 and 9, and it also can be used to make other useful maps.

This information, however, does not eliminate the need for further investigations at sites selected for engineering works, especially works that involve heavy loads or require excavations to depths greater than those shown in the tables, generally depths of more than 5 feet. Also, onsite inspection of all sites is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some terms used in this soil survey have special meanings in soil science that may not be familiar to engineers. Such terms are defined in the Glossary. Other more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual *(17)*.

Engineering classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified Soil Classification System *(20)* used by the Soil Conservation Service, Department of Defense, and other agencies and the system adopted by the American Association of State Highway Officials (AASHO) *(3)*.

In the Unified system, soils are classified according to particle-size distribution, plasticity, liquid limit, and organic-matter content. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes, for example, ML-CL.

The AASHO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A-1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A-7, are clay soils that have low strength when wet and are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A-1, A-2, and A-7 groups are divided as follows: A-1-a, A-1-b; A-2-4, A-2-5, A-2-6, A-2-7; and A-7-5 and A-7-6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 for the poorest. The AASHO classification for tested soils, with group index numbers in parentheses, is shown in table 7; the estimated classification, without group index numbers, is shown in table 8 for all soils mapped in the survey area.

USDA texture is determined by the relative proportions of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter. "Sand," "silt," "clay," and some of the other terms used in the USDA textural classification are defined in the Glossary.

Engineering soil test data

Table 7 contains engineering soil test data for some of the major soil series in Franklin County. These tests were conducted by the Pennsylvania Department of Transportation to help evaluate the soils for engineering purposes. The engineering classifications shown are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Moisture-density data are important in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the *optimum moisture content* is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed *maximum dry density*. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Mechanical analyses show the percentages, by weight, of soil particles that pass sieves of specified sizes. Sand and other coarser materials do not pass the No. 200 sieve. Silt and clay pass the No. 200 sieve. Silt is that material larger than 0.002 millimeter in diameter that passes the No. 200 sieve, and clay is that fraction passing the No. 200 sieve that is smaller than 0.002 millimeter in diameter. The clay fraction was determined by the hydrometer method, rather than by the pipette method used by most soil scientists.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a

TABLE 6.—*Soil limitations for*

Soils	Campsites for tents	Campsites for trailers	Service buildings without basements
Allegheny loam, 2 to 10 percent slopes.	Slight	Moderate: slope	Slight
Alluvial land	Severe: subject to flooding	Severe: subject to flooding	Severe: subject to flooding
Andover very stony loam, 0 to 8 percent slopes.	Severe: high water table	Severe: high water table	Severe: high water table
Andover gravelly silt loam, 2 to 8 percent slopes.	Severe: high water table	Severe: high water table	Severe: high water table
Atkins and Melvin silt loams	Severe: high water table	Severe: high water table	Severe: high water table; subject to flooding.
Atkins silty clay loam, clayey subsoil variant.	Severe: high water table	Severe: high water table	Severe: high water table; subject to flooding.
Bedington channery loam, 3 to 8 percent slopes.	Moderate: channery	Moderate: slope; channery	Slight
Bedington channery loam, 8 to 15 percent slopes.	Moderate: slope; channery	Severe: slope	Moderate: slope
Bedington-Laidig complex, 2 to 8 percent slopes.	Moderate: cobblestones	Moderate: cobblestones; slope.	Slight
Bedington-Laidig complex, 8 to 25 percent slopes.	Severe: slope	Severe: slope	Severe: slope
Berks shaly silt loam, 2 to 8 percent slopes.	Moderate: shaly material	Moderate: shaly material; slope.	Slight
Berks shaly silt loam, 8 to 15 percent slopes.	Moderate: slope; shaly material.	Severe: slope	Moderate: slope
Blairton silt loam, 0 to 3 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Blairton silt loam, 3 to 8 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Brinkerton silt loam, 0 to 3 percent slopes.	Severe: high water table	Severe: high water table	Severe: high water table
Brinkerton silt loam, 3 to 8 percent slopes.	Severe: high water table	Severe: high water table	Severe: high water table
Buchanan gravelly loam, 2 to 8 percent slopes.	Moderate: slow permeability; gravelly material.	Moderate: slow permeability; gravelly material; slope.	Moderate: seasonal high water table.
Buchanan gravelly loam, 8 to 15 percent slopes.	Moderate: slow permeability; gravelly material; slope.	Severe: slope	Moderate: seasonal high water table; slope.
Buchanan extremely stony loam, 0 to 8 percent slopes.	Severe: stoniness	Severe: stoniness	Moderate: seasonal high water table; stoniness.
Buchanan extremely stony loam, 8 to 25 percent slopes.	Severe: slope; stoniness	Severe: slope; stoniness	Severe: slope
Clarksburg silt loam	Moderate: slow permeability	Moderate: slow permeability	Slight
Dekalb and Hazleton extremely stony sandy loams, 0 to 8 per cent slopes.	Severe: stoniness	Severe: stoniness	Moderate: stoniness
Dekalb and Hazleton extremely stony sandy loams, 8 to 25 percent slopes.	Severe: slope; stoniness	Severe: slope; stoniness	Severe: slope
Dekalb and Lehew extremely stony soils, 25 to 75 percent slopes.	Severe: slope; stoniness	Severe: slope; stoniness	Severe: slope

recreational development

Paths and trails	Picnic and play areas (Extensive use)	Athletic fields (Intensive use)	Golf fairways
Slight	Slight	Moderate: slope	Slight.
Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding	Severe: subject to flooding.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Severe: high water table	Severe: high water table	Severe: high water table; gravelly material.	Severe: high water table.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Moderate: channery	Moderate: channery	Severe: channery	Moderate: channery.
Moderate: channery	Moderate: slope; channery	Severe: slope; channery	Moderate: slope; channery.
Moderate: cobblestones	Moderate: cobblestones	Severe: cobblestones	Severe: cobblestones.
Moderate: slope; cobblestones.	Severe: slope	Severe: slope; cobblestones	Severe: slope; cobblestones.
Moderate: shaly material	Moderate: shaly material	Severe: shaly material	Moderate: shaly material; bedrock at a depth of 1½ to 3½ feet.
Moderate: shaly material	Moderate: slope; shaly material.	Severe: slope; shaly material.	Moderate: slope; bedrock at a depth of 1½ to 3½ feet.
Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: bedrock at a depth of 1½ to 3½ feet; seasonal high water table.
Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: bedrock at a depth of 1½ to 3½ feet; seasonal high water table.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Moderate: gravelly material	Moderate: gravelly material	Severe: gravelly material	Moderate: gravelly material.
Moderate: gravelly material	Moderate: gravelly material; slope.	Severe: gravelly material; slope.	Moderate: gravelly material; slope.
Severe: stoniness	Moderate: stoniness	Severe: gravelly material; stoniness.	Severe: stoniness.
Severe: stoniness	Severe: slope	Severe: gravelly material; slope; stoniness.	Severe: slope; stoniness.
Slight	Slight	Moderate: seasonal high water table.	Slight.
Severe: stoniness	Moderate: stoniness	Severe: channery; stoniness	Severe: stoniness.
Severe: stoniness	Severe: slope	Severe: slope; channery; rockiness.	Severe: slope; stoniness.
Severe: slope; stoniness	Severe: slope	Severe: slope; channery; stoniness.	Severe: slope; stoniness.

TABLE 6.—*Soil limitations for*

Soils	Campsites for tents	Campsites for trailers	Service buildings without basements
Duffield silt loam, 0 to 3 percent slopes.	Slight	Slight	Slight
Duffield silt loam, 3 to 8 percent slopes.	Slight	Moderate: slope	Slight
Duffield silt loam, 8 to 15 percent slopes.	Moderate: slope	Severe: slope	Moderate: slope
Duffield silt loam, 8 to 15 percent slopes, eroded.	Moderate: slope	Severe: slope	Moderate: slope
Dunning silty clay loam	Severe: high water table	Severe: high water table	Severe: high water table; subject to flooding.
Dunning silt loam, overwash variant.	Moderate: seasonal high water table; subject to flooding.	Moderate: seasonal high water table; subject to flooding.	Severe: subject to flooding
Edgemont channery loam, 3 to 8 percent slopes.	Moderate: channery	Moderate: slope; channery	Slight
Edgemont channery loam, 8 to 20 percent slopes.	Moderate: slope; channery	Severe: slope	Moderate: slope
Edgemont extremely stony loam, 5 to 20 percent slopes.	Severe. stoniness	Severe: slope; stoniness	Moderate: slope; stoniness
Edom silty clay loam, 2 to 8 percent slopes.	Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer; slope.	Slight
Edom silty clay loam, 8 to 15 percent slopes.	Moderate: silty clay loam surface layer; slope.	Severe: slope	Moderate: slope
Edom silty clay loam, moderately well drained variant, 2 to 8 percent slopes.	Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer; slope.	Slight
Glenville channery silt loam, 3 to 8 percent slopes.	Moderate: seasonal high water table; moderately slow permeability.	Moderate: seasonal high water table; moderately slow permeability; slope.	Moderate: seasonal high water table.
Hagerstown silt loam, 0 to 3 percent slopes.	Slight	Slight	Slight
Hagerstown silt loam, 3 to 8 percent slopes.	Slight	Moderate: slope	Slight
Hagerstown silt loam, 8 to 15 percent slopes.	Moderate: slope	Severe: slope	Moderate: slope
Hagerstown silty clay loam, 2 to 8 percent slopes.	Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer; slope.	Slight
Hagerstown rocky silty clay loam, 3 to 8 percent slopes. eroded.	Moderate: silty clay loam surface layer; rockiness.	Moderate: silty clay loam surface layer; slope; rockiness.	Slight
Hagerstown rocky silty clay loam, 8 to 15 percent slopes, eroded.	Moderate: silty clay loam surface layer; slope; rockiness.	Severe: slope	Moderate: slope
Hagerstown silty clay, 8 to 15 percent slopes, eroded.	Severe: silty clay surface layer.	Severe: silty clay surface layer; slope.	Moderate: slope
Hagerstown silty clay, 15 to 25 percent slopes, eroded.	Severe: silty clay surface layer; slope.	Severe: silty clay surface layer; slope.	Severe: slope
Hagerstown-Rock outcrop complex, 0 to 8 percent slopes.	Moderate: silty clay loam surface layer; rockiness.	Moderate: silty clay loam surface layer; slope; rockiness.	Moderate: rockiness
Hagerstown-Rock outcrop complex, 8 to 30 percent slopes.	Severe: slope	Severe: slope	Severe: slope
Highfield channery silt loam, 3 to 8 percent slopes.	Moderate: channery	Moderate: channery; slope	Slight
Highfield channery silt loam, 8 to 15 percent slopes.	Moderate: slope; channery	Severe: slope	Moderate: slope

recreational development—Continued

Paths and trails	Picnic and play areas (Extensive use)	Athletic fields (Intensive use)	Golf fairways
Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Slight.
Slight	Moderate: slope	Severe: slope	Moderate: slope.
Slight	Moderate: slope	Severe: slope	Severe: eroded.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Moderate: seasonal high water table.	Moderate: seasonal high water table; subject to flooding.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Moderate: channery	Moderate: channery	Severe: channery	Moderate: channery.
Moderate: channery	Moderate: slope; channery	Severe: slope; channery	Moderate: slope; channery.
Severe: stoniness	Moderate: slope; stoniness	Severe: slope; channery; stoniness.	Severe: stoniness.
Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer; slope.	Moderate: silty clay loam surface layer.
Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer; slope.	Severe: slope	Moderate: silty clay loam surface layer; slope.
Moderate: silty slay loam surface layer.	Moderate: silty clay loam surface layer.	Moderate: seasonal high water table; slope.	Moderate: silty clay loam surface layer.
Moderate: channery	Moderate: channery	Severe: channery	Moderate: channery.
Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Slight.
Slight	Moderate: slope	Severe: slope	Moderate: slope.
Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer; slope.	Moderate: silty clay loam surface layer.
Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer; slope; rockiness.	Moderate: silty clay loam surface layer; rockiness; eroded.
Moderate: silty clay loam surface layer.	Moderate: silty clay loam surface layer; slope.	Severe: slope	Severe: eroded.
Severe: silty clay surface layer.	Severe: silty clay surface layer.	Severe: silty clay surface layer; slope.	Severe: silty clay surface layer; slope; eroded.
Severe: silty clay surface layer.	Severe: silty clay surface layer; slope.	Severe: silty clay surface layer; slope.	Severe: silty clay surface layer; eroded.
Moderate: silty clay loam surface layer; rockiness.	Moderate: silty clay loam surface layer; rockiness.	Severe: rockiness	Severe: rockiness.
Moderate: silty clay loam surface layer; rockiness; slope.	Severe: slope	Severe: slope; rockiness	Severe: slope; rockiness.
Moderate: channery	Moderate: channery	Severe: channery	Moderate: channery.
Moderate: channery	Moderate: slope; channery	Severe: slope; channery	Moderate: slope; channery.

TABLE 6.—*Soil limitations for*

Soils	Campsites for tents	Campsites for trailers	Service buildings without basements
Highfield extremely stony silt loam, 8 to 25 percent slopes.	Severe: slope; stoniness	Severe: slope; stoniness	Severe: slope; stoniness.
Highfield extremely stony silt loam, 25 to 70 percent slopes.	Severe: slope; stoniness	Severe: slope; stoniness	Severe: slope
Laidig extremely stony sandy loam, 0 to 8 percent slopes.	Severe: stoniness	Severe: stoniness	Severe: slope
Laidig extremely stony sandy loam, 8 to 25 percent slopes.	Severe: slope; stoniness	Severe: slope; stoniness	Moderate: stoniness
Laidig extremely stony sandy loam, 25 to 45 percent slopes.	Severe: slope; stoniness	Severe: slope; stoniness	Severe: slope
Laidig gravelly loam, 3 to 8 percent slopes.	Moderate: moderately slow permeability; gravelly material.	Moderate: moderately slow permeability; gravelly material; slope.	Severe: slope
Laidig gravelly loam, 8 to 15 percent slopes.	Moderate: moderately slow permeability; slope; gravelly material.	Severe: slope	Slight
Leetonia extremely stony loamy sand, 0 to 12 percent slopes.	Severe: stoniness	Severe: stoniness	Moderate: slope
Lehew extremely stony loam, 8 to 25 percent slopes.	Severe: slope; stoniness	Severe: slope; stoniness	Moderate: stoniness
Markes shaly silt loam, 2 to 8 percent slopes.	Severe: high water table	Severe: high water table	Severe: slope
Meckesville extremely stony loam, 8 to 25 percent slopes.	Severe: slope; stoniness	Severe: slope; stoniness	Severe: high water table
Monongahela silt loam, 3 to 8 percent slopes.	Moderate: slow permeability	Moderate: slow permeability; slope.	Severe: slope
Murrill gravelly sandy loam, 3 to 8 percent slopes.	Moderate: gravelly material	Moderate: gravelly material; slope.	Slight
Murrill gravelly sandy loam, 8 to 15 percent slopes.	Moderate: gravelly material; slope.	Severe: slope	Slight
Murrill cobbly sandy loam, 3 to 8 percent slopes.	Moderate: cobblestones	Moderate: slope; cobblestones.	Moderate: slope
Murrill cobbly sandy loam, 8 to 15 percent slopes.	Moderate: slope; cobblestones.	Severe: slope	Slight
Murrill extremely stony sandy loam, 0 to 8 percent slopes.	Severe: stoniness	Severe: stoniness	Moderate: slope
Murrill extremely stony sandy loam, 8 to 25 percent slopes.	Severe: slope; stoniness	Severe: slope; stoniness	Moderate: stoniness
Murrill gravelly loam, 0 to 3 percent slopes.	Moderate: gravelly material	Moderate: gravelly material	Severe: slope
Murrill gravelly loam, 3 to 8 percent slopes.	Moderate: gravelly material	Moderate: gravelly material; slope.	Slight
Murrill gravelly loam, 8 to 15 percent slopes.	Moderate: gravelly material; slope.	Severe: slope	Slight
Nolin silt loam, local alluvium	Moderate: subject to flooding.	Moderate: subject to flooding.	Moderate: slope
Penlaw silt loam	Moderate: seasonal high water table; slow permeability.	Moderate: seasonal high water table; slow permeability.	Severe: subject to flooding
Philo silt loam	Moderate: moderate to moderately slow permeability; subject to flooding.	Moderate: moderately slow permeability; subject to flooding.	Moderate: seasonal high water table.
Pope soils	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding

recreational development—Continued

Paths and trails	Picnic and play areas (Extensive use)	Athletic fields (Intensive use)	Golf fairways
Severe: stoniness	Severe: slope	Severe: slope; stoniness	Severe: slope; stoniness.
Severe: slope; stoniness	Severe: slope	Severe: slope; stoniness	Severe: stoniness.
Severe: stoniness	Moderate: stoniness	Severe: gravelly material; stoniness.	Severe: slope; stoniness.
Severe: stoniness	Severe: slope	Severe: gravelly material; slope; stoniness.	Severe: slope; stoniness.
Severe: slope; stoniness	Severe: slope	Severe: gravelly material; slope; stoniness.	Moderate: gravelly material.
Moderate: gravelly material	Moderate: gravelly material	Severe: gravelly material	Moderate: slope; gravelly material.
Moderate: gravelly material	Moderate: slope; gravelly material.	Severe: slope; gravelly material.	Severe: loamy sand surface layer; stoniness.
Severe: stoniness	Moderate: loamy sand surface layer; stoniness.	Severe: stoniness; channery	Severe: slope; stoniness.
Severe: stoniness	Severe: slope	Severe: slope; stoniness; channery.	Severe: high water table.
Severe: high water table	Severe: high water table	Severe: high water table; shaly material.	Severe: slope; stoniness.
Severe: stoniness	Severe: slope	Severe: slope; stoniness	Slight.
Slight	Slight	Moderate: seasonal high water table; slope.	Moderate: sandy loam surface layer; gravelly material.
Moderate: gravelly material	Moderate: gravelly material	Severe: gravelly material	Moderate: sandy loam surface layer; slope; gravelly material.
Moderate: gravelly material	Moderate: gravelly material; slope.	Severe: gravelly material; slope.	Severe: cobblestones.
Moderate: cobblestones	Moderate: cobblestones	Severe: cobblestones	Severe: cobblestones.
Moderate: cobblestones	Moderate: slope; cobblestones.	Severe: slope; cobblestones	Severe: stoniness.
Severe: stoniness	Moderate: stoniness	Severe: gravelly material; stoniness.	Severe: slope; stoniness.
Severe: stoniness	Severe: slope	Severe: gravelly material; slope; stoniness.	Moderate: gravelly material.
Moderate: gravelly material	Moderate: gravelly material	Severe: gravelly material	Moderate: gravelly material.
Moderate: gravelly material	Moderate: gravelly material	Severe: gravelly material	Moderate: gravelly material; slope.
Moderate: gravelly material	Moderate: gravelly material; slope.	Severe: gravelly material; slope.	Moderate: subject to flooding.
Slight	Moderate: subject to flooding.	Moderate: subject to flooding.	Moderate: seasonal high water table.
Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: subject to flooding.
Slight	Moderate: subject to flooding.	Moderate: seasonal high water table; subject to flooding.	Moderate: subject to flooding.
Slight	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: high water table.

TABLE 6.—*Soil limitations for*

Soils	Campsites for tents	Campsites for trailers	Service buildings without basements
Purdy silty clay loam	Severe: high water table	Severe: high water table	Severe: high water table
Ryder silt loam, 3 to 8 percent, slopes.	Slight	Moderate: slope	Slight
Ryder silt loam, 8 to 15 percent slopes.	Moderate: slope	Severe: slope	Moderate: slope
Ryder silt loam, 15 to 25 percent slopes.	Severe: slope	Severe: slope	Severe: slope
Tyler silt loam	Moderate: seasonal high water table; slow permeability.	Moderate: seasonal high water table; slow permeability.	Moderate: seasonal high water table.
Urban land. Characteristics variable. Onsite investigation needed.			
Vanderlip cobbly loamy sand, 0 to 25 percent slope.	Severe: slope	Severe: slope	Severe: slope
Vanderlip cobbly loamy sand, 25 to 50 percent slopes.	Severe: slope	Severe: slope	Severe: slope
Very stony land, Dekalb soil material.	Severe: slope; stoniness	Severe: slope; stoniness	Severe: slope; stoniness
Warners silt loam	Severe: high water table	Severe: high water table	Severe: high water table; subject to flooding.
Weikert shaly silt loam, 2 to 8 percent slopes.	Moderate: shaly material	Moderate: slope; shaly material.	Moderate: bedrock at a depth of 1 to 1½ feet.
Weikert shaly silt loam, 8 to 15 percent slopes.	Moderate: slope; shaly material.	Severe: slope	Moderate: bedrock at a depth of 1 to 1½ feet; slope.
Weikert shaly silt loam, 15 to 25 percent slopes.	Severe: slope	Severe: slope	Severe: slope
Weikert shaly silt loam, 25 to 70 percent slopes.	Severe: slope	Severe: slope	Severe: slope
Weikert very shaly silt loam, 3 to 8 percent slopes, eroded.	Severe: very shaly material	Severe: very shaly material	Moderate: bedrock at a depth of 1 to 1½ feet.
Weikert very shaly silt loam, 8 to 15 percent slopes, eroded.	Severe: very shaly material	Severe: slope; very shaly material.	Moderate: bedrock at a depth of 1 to 1½ feet; slope.
Weikert very shaly silt loam, 15 to 25 percent slopes, eroded.	Severe: slope; very shaly material.	Severe: slope; very shaly material.	Severe: slope

recreational development—Continued

Paths and trails	Picnic and play areas (Extensive use)	Athletic fields (Intensive use)	Golf fairways
Severe: high water table	Severe: high water table	Severe: high water table	Severe: subject to flooding.
Slight	Slight	Moderate: bedrock at a depth of 2 to 3½ feet; slope.	Moderate: bedrock at a depth of 2 to 3½ feet.
Slight	Moderate: slope	Severe: slope	Moderate: bedrock at a depth of 2 to 3½ feet; slope.
Moderate: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Moderate: loamy sand surface layer; slope; cobblestones.	Severe: slope	Severe: slope; cobblestones	Severe: slope; cobblestones.
Severe: slope	Severe: slope	Severe: slope; cobblestones	Severe: slope; cobblestones.
Severe: slope; stoniness	Severe: slope; stoniness	Severe: slope; stoniness	Severe: slope; stoniness.
Severe: high water table	Severe: high water table	Severe: high water table	Severe: high water table.
Moderate: shaly material	Moderate: shaly material	Severe: bedrock at a depth of 1 to 1½ feet; shaly material.	Severe: bedrock at a depth of 1 to 1½ feet.
Moderate: shaly material	Moderate: slope; shaly material.	Severe: bedrock at a depth of 1 to 1½ feet; slope; shaly material.	Severe: bedrock at a depth of 1 to 1½ feet; slope.
Moderate: slope; shaly material.	Severe: slope	Severe: bedrock at a depth of 1 to 1½ feet; slope; shaly material.	Severe: bedrock at a depth of 1 to 1½ feet; slope.
Severe: slope	Severe: slope	Severe: bedrock at a depth of 1 to 1½ feet; slope; shaly material.	Severe: bedrock at a depth of 1 to 1½ feet; slope.
Severe: very shaly material	Severe: very shaly material	Severe: bedrock at a depth of 1 to 1½ feet; shaly material.	Severe: bedrock at a depth of 1 to 1½ feet; shaly material.
Severe: very shaly material	Severe: very shaly material	Severe: bedrock at a depth of 1 to 1½ feet; slope; shaly material.	Severe: bedrock at a depth of 1 to 1½ feet; shaly material.
Severe: very shaly material	Severe: slope; very shaly material.	Severe: bedrock at a depth of 1 to 1½ feet; slope; shaly material.	Severe: bedrock at a depth of 1 to 1½ feet; shaly material.
Severe: very shaly material	Severe: slope; very shaly material.	Severe: bedrock at a depth of 1 to 1½ feet; slope; shaly material.	Severe: bedrock at a depth of 1 to 1½ feet; slope; shaly material.

TABLE 7.—*Engineering*

[Tests performed by the Pennsylvania Department of Transportation in accordance with

Soil name and location	Parent material	Engineering report number	Depth from surface	Moisture-density [1]	
				Maximum dry density	Optimum moisture
			Inches	*Pound per cubic foot*	*Percent*
Berks shaly silt loam: Hamilton Township. 1.5 mile southeast of Freys, 150 yards south of Rural Road 28039. Modal.	Shale, siltstone, and fine-grained sandstone.	BP–6820 BP–6821	10–18 18–26	113 113	16 16
Blairton silt loam: Antrim Township. 0.5 mile west of junction of U.S. Highway 11 and Rural Road 28032 on U.S. Highway 11. Modal.	Noncalcareous gray shales.	69–32639 69–32640	8–27 27–33	111 103	16 19
Duffield silt loam: Guilford Township. 1.2 miles northeast of Duffield, 0.2 mile northwest of junction of Pennsylvania Highway 997 and Township Road 499. Modal.	Impure limestone.	BP–6832 BP–6833	20–29 56–95	104 96	18 23
Dunning silty clay loam: Southampton Township. 1,500 feet southwest of junction of U.S. Highway 11 and Rural Road 28015. Modal.	Alluvium.	69–34655 69–34656	21–48 48–70	112 125	15 12
Dunning silt loam, overwash variant: Washington Township. 0.2 mile south of junction of Township Road 386 and Pennsylvania Highway 316, 20 feet from stream channel. Modal.	Alluvium.	BP–6828 BP–6829	10–21 32–46	103 104	19 19
Edom silty clay loam: Metal Township. 0.25 mile southeast of junction of Pennsylvania Highway 75 and Township Road 559. Modal.	Shaly limestone and calcareous shale.	69–34664 69–34665	8–23 23–33	102 101	18 22
Markes shaly silt loam: Hamilton Township. 1 mile southeast of Freys, 500 feet south of junction of Rural Road 28039 and Township Road 458. Modal.	Noncalcareous shale.	BP–6822 BP–6823	11–19 19–29	112 111	16 17
Murrill gravelly loam: Greene Township. 400 feet northeast of junction of Township Road 509 and Pennsylvania Highway 997. Modal.	Colluvium derived from sandstone and shale underlain by material weathered from limestone.	69–34644 69–34645	13–46 46–60	102 108	22 18
Purdy silty clay loam: Lurgan Township. 1.4 miles northeast of Pleasant Hall, 1 mile west of Orrstown crossroads. Modal.	Old alluvium.	69–32629 69–32630	14–36 36–66	104 115	16 14
Warners silt loam: Antrim Township. 1.25 miles south of junction of Pennsylvania Highway 16 and U.S. Highway 81, 100 feet west of U.S. Highway 81. Modal.	Stream deposits high in marl or calcium carbonate.	69–34646 69–34647	9–48 48–57	106 96	18 24

[1] Based on AASHO Designation T99–57, Method A.

[2] Mechanical analyses according to the AASHO Designation T88–57. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis

test data

standard procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [2]											Liquid limit	Plasticity index	Classification	
Percentage passing sieve—							Percentage smaller than—							
1 in	¾ in	⅜ in	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHO [3]	Unified
											Percent			
100	99	84	71	55	39	32	31	24	14	9	31	5	A-2-4(0)	SM
97	91	63	48	35	26	21	21	18	10	7	32	7	A-2-4(0)	GM-GC
......	100	99	95	84	74	71	69	59	42	28	35	10	A-4(6)	ML-CL
95	91	88	84	78	69	65	63	54	44	35	48	21	A-7-6(12)	ML-CL
100	98	98	97	94	91	76	72	56	35	25	40	12	A-6(9)	ML
......	......	......	......	100	99	92	89	76	54	46	57	29	A-7-6(19)	MH-CH
......	......	......	......	100	98	88	83	....	37	29	34	15	A-6(10)	CL
100	95	85	74	59	48	23	20	12	9	7	22	2	A-1-b(0)	SM
......	......	......	......	100	99	88	86	72	38	22	40	10	A-4(8)	ML
...	......	......	......	100	93	78	76	70	54	46	53	25	A-7-6(17)	ML-CH
......	......	......	......	100	99	97	96	87	68	53	46	18	A-7-6(21)	ML-CL
......	100	98	97	97	96	95	93	88	73	63	58	28	A-7-5(32)	MH-CH
......	100	90	85	77	60	53	52	45	25	17	30	6	A-4(4)	ML-CL
......	100	91	85	74	62	54	53	46	30	21	33	8	A-4(4)	ML-CL
......	......	100	99	99	96	89	87	78	63	53	54	25	A-7-6(26)	MH-CH
100	99	95	94	92	84	67	63	57	47	38	47	21	A-7-6(14)	ML-CL
......	......	..	......	100	97	92	90	80	62	51	50	24	A-7-6(25)	MH-CH
100	97	97	97	96	92	73	70	55	38	30	29	12	A-6(6)	CL
96	90	81	72	65	51	44	40	32	21	14	36	12	A-6(2)	SM-SC
......	......	......	100	99	87	77	72	54	39	28	47	8	A-5(8)	ML

of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soils.

[3] Based on AASHO Designation M145-66I.

TABLE 8.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made of two or more kinds of soil that may that appear in the first column. The symbol >

Soil series and map symbols	Depth to— Seasonal high water table	Depth to— Bedrock	Depth from surface of representative profile	USDA texture of representative profile	Coarse fraction greater than 3 inches	Percentage passing sieve— No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)
	Feet	*Feet*	*Inches*		*Percent*				
Allegheny: AlB	>3	>4	0–9	Loam	0–10	75–100	70–100	50–100	50–80
			9–30	Clay loam, sandy clay loam.	0–10	70–100	70–95	65–95	45–95
			30–48	Sandy loam (variable).	0–45	50–95	50–90	40–80	15–75
Alluvial land: Am. Properties too variable to estimate.									
Andover: AnB, AoB	0–½	>4	0–8	Gravelly silt loam	0–10	80–95	65–90	60–85	45–75
			8–46	Gravelly loam, gravelly clay loam.	0–10	80–95	65–90	60–85	30–60
			46–58	Gravelly sandy clay loam.	5–15	70–85	60–80	55–70	25–45
*Atkins: As For properties of Melvin soil, see Melvin series.	[1] 0–½	>4	0–9	Silt loam	...	90–100	90–100	85–100	60–95
			9–48	Light silty clay loam.	...	85–100	80–100	55–75	35–75
			48–58	Silty clay loam, (variable).	0–10	60–95	60–80	50–70	15–60
Atkins clayey subsoil variant: At.	0	4	0–7	Silty clay loam	...	95–100	90–100	90–100	90–100
			7–36	Silty clay, silty clay loam.	...	95–100	90–100	85–100	75–95
			36–52	Sandy clay loam, gravelly sandy clay loam.	0–5	95–100	80–100	75–90	35–55
*Bedington: BcB, BcC, BdB, BdD. For the Laidig soils in BdB and BdD, see the Laidig series.	>3	>4	0–10	Channery loam	...	70–100	65–95	60–90	50–65
			10–42	Channery silt loam	...	70–100	65–95	60–90	40–65
			42–66	Very channery silt loam, very channery silty clay loam.	0–5	55–90	40–80	40–80	30–45
Berks: BeB, BeC	>3	1½–3½	0–10	Shaly silt loam	0–20	45–70	40–70	35–60	25–60
			10–26	Very shaly loam	0–30	40–75	35–60	20–60	15–45
			26–36	Very shaly loam	0–40	15–65	10–55	5–45	5–35
			36	Shale bedrock.					
Blairton: BlA, BlB	½–3	1½–3½	0–9	Silt loam	...	70–100	60–90	55–90	50–85
			9–38	Silt loam, shaly silt loam, shaly silty clay loam, very shaly loam.	...	55–95	45–85	40–80	35–75
			38	Shale bedrock.					
Brinkerton: BrA, BrB.	0–½	>4	0–9	Silt loam	0–10	90–100	85–100	85–100	75–100
			9–18	Silty clay loam	0–10	90–100	85–100	85–100	65–95
			18–50	Silty clay loam, shaly silt loam.	0–10	70–100	60–100	55–100	40–90

significant to engineering

have different properties and limitations. It is therefore necessary to follow carefully the instructions for referring to other series means more than; the symbol < means less than]

Engineering classification		Range in permeability	Range in available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential	Corrosion potential for—	
Unified	AASHO							Steel	Concrete
		Inches per hour	*Inches per inch of depth*	*pH*	*Percent*	*Lb per cu ft*			
ML	A–4	0.6–6.0	0.10–0.18	4.5–7.3	....	....	Low	Low	Moderate.
ML, CL, SM	A–4, A–6	0.6–2.0	0.10–0.14	4.5–5.5	10–15	110–125	Low	Low	Moderate.
ML, CL, SM, SC, GM, GC	A–2, A–4, A–6	0.6–6.0	0.08–0.14	4.0–5.5	5–10	120–130	Low	Low	Moderate.
ML, CL, SM, SC	A–4	0.2–6.0	0.12–0.20	4.5–6.5	....	....	Low	High	Moderate.
SM, SC, ML, CL	A–2, A–4	<0.2	0.08–0.12	4.5–5.5	12–17	118–125	Low	High	Moderate.
SM, SC	A–2, A–4	0.6–6.0	0.06–0.10	4.5–5.5	10–14	120–126	Low	High	Moderate.
ML, CL	A–4, A–6	0.6–2.0	0.18–0.22	4.5–6.5	....	....	Low	High	High.
CL, SM-SC	A–2, A–4, A–6	<0.2–2.0	0.14–0.18	4.5–5.5	12–18	105–110	Low	High	High.
ML, CL, SM, SC	A–2, A–4, A–6	0.2–6.0	0.08–0.16	4.5–5.5	8–14	108–120	Low	High	High.
ML	A–4	0.2–0.6	0.18–0.24	4.5–6.5	....	....	Low	High	High.
ML, CL	A–4, A–6, A–7	0.2–0.6	0.10–0.16	4.5–5.5	12–18	105–110	Moderate	High	High.
SC, CL	A–2, A–4, A–6	0.2–6.0	0.10–0.14	4.5–5.5	10–16	110–120	Low	High	High.
ML	A–4	0.6–2.0	0.14–0.18	4.0–7.3	....	....	Low	Moderate	Moderate.
ML, CL, GM-GC	A–4, A–6	0.6–6.0	0.12–0.14	4.0–5.5	14–18	110–118	Low	Moderate	High.
GM-GC, SM, SC	A–2, A–4	2.0–6.0	0.08–0.12	4.0–5.5	12–18	114–120	Low	Moderate	High.
GM, GC, ML	A–2, A–4 A–6	2.0–6.0	0.08–0.14	4.5–7.3	....	....	Low	Low	Moderate.
GM, GC, SM, SC, GM-GC	A–1, A–2 A–4	0.6–>6.0	0.08–0.12	4.5–5.5	14–19	110–116	Low	Low	High.
GM, GC, SM, GM-GC	A–1, A–2	2.0–>6.0	0.04–0.10	4.5–5.5	13–19	105–116	Low	Low	High.
ML	A–4	0.6–2.0	0.12–0.18	4.5–6.5	....	....	Low	Moderate	Moderate.
ML, CL, SM, GM	A–4, A–6, A–7	0.2–2.0	0.08–0.14	4.5–5.5	14–20	100–117	Moderate	Moderate	High.
ML, CL	A–4, A–6	0.2–2.0	0.18–0.24	4.5–6.5	....	....	Low	High	Moderate.
ML, CL, MH, CH	A–4, A–6 A–7	0.2–0.6	0.14–0.18	4.5–6.0	16–22	100–112	Moderate	High	Moderate.
ML, CL, SM, SC, GM, GC	A–4, A–6 A–7	<0.2	0.08–0.12	4.5–6.0	12–17	110–120	Moderate	High	Moderate.

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to— Seasonal high water table	Depth to— Bedrock	Depth from surface of representative profile	USDA texture of representative profile	Coarse fraction greater than 3 inches	Percentage passing sieve— No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)
	Feet	*Feet*	*Inches*		*Percent*				
Buchanan: BuB, BuC, BxB, BxD.	½–3	>5	0–9	Gravelly loam	0–10	65–100	60–95	55–80	30–70
			9–20	Gravelly loam, gravelly sandy clay loam.	0–20	65–100	60–95	55–80	30–70
			20–50	Gravelly clay loam, sandy clay loam.	0–20	45–80	40–75	35–70	20–55
Clarksburg: Ck	1½–3	>5	0–10	Silt loam	0–5	80–100	75–95	70–90	50–85
			10–32	Silty clay loam	0–10	80–100	80–95	70–90	50–85
			32–60	Silty clay loam	0–10	70–100	50–85	40–80	30–75
*Dekalb: DeB, DeD, DlF. For the Hazleton soils in DeB and DeD, and the Lehew soils in DlF, refer to the Hazleton or Lehew series.	>3	1½–3½	0–8	Cobbly sandy loam	0–30	50–85	40–75	35–65	15–55
			8–28	Cobbly sandy loam	10–40	50–85	40–80	40–75	20–55
			28–35	Very cobbly sandy loam.	10–60	45–85	35–75	25–65	15–40
			35	Sandstone bedrock.					
Duffield: DsA, DsB, DsC, DsC3.	>3	>6	0–10	Silt loam	....	70–100	70–100	65–95	55–90
			10–56	Silty clay loam, silt loam, channery loam, loam.	0–10	85–100	85–100	80–100	70–95
			56–95	Clay (variable)	0–10	85–100	85–100	80–100	75–95
Dunning: Du	[1] 0–½	>6	0–10	Silty clay loam	....	95–100	90–100	85–100	75–95
			10–40	Silty clay, silty clay loam.	......	95–100	90–100	85–100	80–100
			40–70	Loam, sandy clay loam.	....	70–100	55–100	45–100	20–95
Dunning overwash variant: Dv.	[1] ½–3	>6	0–10	Silt loam	....	95–100	95–100	90–100	70–90
			10–56	Silt loam, gravelly clay loam, gravelly sandy clay loam.	....	90–100	85–100	50–100	25–90
			56–60	Stratified gravel	0–10	60–95	60–80	50–70	15–60
Edgemont: EcB, EcC, EdC.	>3	3½–6	0–10	Channery loam	0–10	55–95	45–90	35–85	15–40
			10–33	Channery loam	0–10	60–90	55–75	45–65	25–35
			33–48	Very channery loam.	10–25	55–80	50–75	40–65	15–30
Edom: EeB, EeC	>3	3½–5	0–8	Silty clay loam	....	85–100	80–100	75–95	65–85
			8–33	Silty clay loam, silty clay.	0–10	70–100	65–100	65–100	55–100
			33–42	Very channery clay	10–20	25–55	20–40	15–40	15–35
			42	Shaly limestone.					
Edom moderately well drained variant: ElB.	1½–3	3½–5	0–7	Silty clay loam	....	85–100	80–100	75–95	65–85
			7–30	Silty clay loam, silty clay.	0–10	70–95	65–90	65–85	55–85
			30–42	Shaly silty clay loam.	10–20	25–75	20–70	15–60	15–35
			42	Calcareous shale bedrock.					
Glenville: GlB	½–3	4–6	0–12	Channery silt loam	....	85–100	80–95	75–85	65–80
			12–39	Channery silty clay loam, channery silt loam.	....	85–100	85–100	80–95	65–90
			39–54	Channery silt loam	....	75–100	75–100	65–90	40–85

significant to engineering—Continued

Engineering classification		Range in permeability	Range in available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential	Corrosion potential for—	
Unified	AASHO							Steel	Concrete
		Inches per hour	*Inches per inch of depth*	*pH*	*Lb per cu ft*	*Percent*			
ML, CL, SM, GM	A–2, A–4	0.6–2.0	0.12–0.18	4.0–6.5	....	....	Low..............	Moderate..	Moderate.
ML, CL, SM, GM	A–2, A–4	0.6–2.0	0.10–0.16	4.0–5.5	12–16	114–120	Low..............	Moderate..	High.
ML, CL, SM, GM	A–2, A–4	<0.2	0.06–0.10	4.0–5.5	10–14	116–124	Low..............	Moderate .	High.
ML	A–4	0.6–6.0	0.1 –0.20	4.1–7.3	....	....	Low..............	Moderate..	Low.
ML, CL	A–4, A–6 A–7	0.2–0.6	0.12–0.14	5.1–6.5	15–18	106–115	Low to moderate.	Moderate..	High.
SC, CL, ML	A–2, A–4, A–6, A–7	<0.2	0.06–0.12	5.1–6.5	15–18	106–115	Low to moderate.	Moderate .	High.
SM, GM, ML	A–2, A–4	>6.0	0.08–0.12	4.0–5.0	....	....	Low..............	Low..........	High.
ML, SM, GM	A–2, A–4	>6.3	0.06–0.12	4.0–5.5	10–15	115-123	Low	Low..........	High.
SM, GM	A–2, A–4	>6.3	0.05–0.10	4.0–5.5	9–13	115–125	Low..............	Low..........	High.
ML, CL	A–4, A–6	0.6–2.0	0.16–0.22	6.1–7.8	....	....	Low..............	Moderate..	Moderate.
ML, CL, MH, CH	A–4, A–6 A–7	0.6–2.0	0.14–0.20	5.1–6.5	15–20	100–115	Moderate	Moderate .	Moderate.
ML, CL, MH, CH	A–4, A–6, A–7	0.6–2.0	0.14–0.20	5.1–6.0	15–25	95–105	Moderate.......	Moderate..	Moderate.
ML, CL	A–4, A–6	0.2–0.6	0.18–0.27	5.6–7.8	....	....	Moderate.......	Moderate..	Moderate.
ML, CL, CH	A–4, A–6, A–7	<0.2	0.12–0.18	5.6–7.8	10–15	105–120	Moderate.......	Moderate..	Low.
ML, CL, CH, SM	A–7, A–2, A–1	<0.2	0.12–0.18	5.6–7.8	10–15	105–130	Moderate .	Moderate..	Low.
ML, CL	A–4, A–6	0.6–2.0	0.16–0.20	5.6–7.9	....	....	Low..............	Moderate..	Moderate.
ML, CL, CH, SM, SC, MH	A–2, A–4, A–6, A–7	0.6–2.0	0.14–0.20	6.1–7.9	15–20	100–120	Low..............	Moderate	Moderate.
ML, CL, SM, SC	A–2, A–4, A–6	0.6–6.0	0.08–0.16	6.1–7.9	8–14	108–120	Low..............	Moderate..	Moderate.
SM, GM	A–1, A–2, A–4	2.0–6.0	0.10–0.14	4.5–6.5	....	....	Low..............	Moderate .	Moderate.
SM, GM	A–2	0.6–6.0	0.08–0.12	4.0–5.5	10–14	116–124	Low..............	Moderate..	High.
SM, GM	A–1, A–2	2.0–6.0	0.06–0.10	4.0–5.5	10–14	116–124	Low..............	Moderate..	High.
ML, CL	A–4, A–6	0.6–6.0	0.14–0.20	6.1–7.8	....	....	Low..............	Moderate..	Moderate.
ML, CL, MH-CH	A–4, A–6, A–7	0.6–2.0	0.10–0.14	6.1–7.8	18–25	95–105	Moderate to high.	Moderate..	Low.
GC, GM	A–2	0.6–2.0	0.04–0.08	6.6–7.8	18–22	100–108	Moderate	Moderate..	Low.
ML, CL	A–4, A–6	0.6–2.0	0.14–0.20	6.1–7.3	....	....	Low..............	Moderate..	Moderate.
ML, CL, MH-CH	A–4, A–6 A–7	<0.2	0.12–0.18	5.6–7.3	20–25	95–105	Moderate to high.	High..........	Moderate.
GM, GC	A–2	2.0–6.0	0.10–0.17	6.1–7.8	18–22	100–108	Moderate.......	Moderate..	Low.
ML, CL	A–4	0.6–2.0	0.16–0.20	4.5–6.5	....	....	Low..............	Moderate .	High.
ML, CL	A–4, A–6	0.6–2.0	0.12–0.16	4.5–5.5	14–18	104–111	Low..............	High..........	High.
ML, CL, SC, SM	A–4	0.2–0.6	0.10–0.14	4.5–5.5	14–17	105–115	Low........ ..	Moderate..	High.

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to— Seasonal high water table	Depth to— Bedrock	Depth from surface of representative profile	USDA texture of representative profile	Coarse fraction greater than 3 inches	Percentage passing sieve— No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)
	Feet	*Feet*	*Inches*		*Percent*				
*Hagerstown: HeA, HeB, HeC, HfB, HgB3, HgC3, HhC3, HhD3, HkB, HkD. Rock outcrop in HkB and HkD is not rated.	>3	3½–7	0–10	Silt loam	0–5	90–100	90–100	80–100	75–95
			10–73	Silty clay, silty clay loam.	0–5	85–100	80–100	75–100	70–95
			73	Limestone bedrock.					
Hazleton. Mapped only with Dekalb soil in DeB and DeD.	>3	4–6	0–10	Channery sandy loam.	....	90–100	90–100	75–90	55–75
			10–42	Channery sandy loam.	0–15	65–85	55–75	50–75	30–55
			42–60	Very channery sandy loam.	0–30	60–85	30–80	25–70	20–55
			60	Sandstone bedrock.					
Highfield: HlB, HlC, HmD, HmF.	>3	3½–6	0–9	Channery silt loam	0–5	60–85	55–80	45–70	40–55
			9–36	Channery silt loam	0–10	60–85	55–80	45–70	40–55
			36–55	Channery silt loam	0–10	45–65	40–60	35–50	20–40
			55	Metarhyolite bedrock.					
Laidig: LaB, LaD, LaE, LdB, LdC.	>3	>6	0–16	Channery sandy loam.	0–10	55–75	50–70	40–55	20–45
			16–36	Channery sandy loam, channery sandy clay loam.	5–20	55–75	50–70	40–55	20–45
			36–60	Channery clay loam, channery sandy clay loam.	5–20	50–75	45–70	40–55	15–40
Leetonia: LeB	>3	2½–3½	0–9	Very channery loamy sand.	0–10	55–85	45–75	35–60	25–45
			9–34	Channery loamy sand, very channery loamy sand.	0–30	45–80	25–65	25–50	10–25
			34	Sandstone bedrock.					
Lehew: LhD	>3	1½–3½	0–7	Very channery loam, very channery fine sandy loam.	0–30	50–85	40–80	40–75	20–55
			7–28	Very channery fine sandy loam, very channery loam.	10–50	45–85	10–75	10–60	10–45
			28	Sandstone bedrock.					
Markes: MaB	0–½	1½–3½	0–11	Shaly silt loam	....	70–100	60–95	55–90	50–85
			11–32	Very shaly clay loam, very shaly loam.	0–10	85–100	70–85	60–75	50–75
			32	Shale bedrock.					
Meckesville: McD	>3	>5	0–9	Channery loam, loam.	0–10	80–100	70–90	65–85	55–70
			9–36	Channery loam, silty clay loam, loam.	0–15	80–100	70–90	65–85	55–70
			36–65	Channery loam	0–40	50–95	45–85	40–80	30–65
Melvin. Mapped only with Atkins soil in As.	[1] 0–½	>6	0–68	Silt loam, silty clay loam.	....	90–100	90–100	90–100	65–90
			68–72	Stratified silt and sand.	....	70–100	70–100	65–85	25–80
Monongahela: MoB	1½–3	>6	0–7	Silt loam	....	90–100	85–100	80–100	70–100
			7–22	Silty clay loam, silt loam.	0–10	90–100	90–100	80–100	70–90
			22–55	Silty clay loam	0–10	80–100	75–100	70–100	50–95
			55–66	Clay loam	0–10	75–100	75–100	70–100	35–75

significant to engineering—Continued

Engineering classification		Range in permeability	Range in available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential	Corrosion potential for—	
Unified	AASHO							Steel	Concrete
		Inches per hour	*Inches per inch of depth*	*pH*	*Lb per cu ft*	*Percent*			
ML, CL	A–4; A–6	0.6–2.0	0.16–0.20	6.1–7.3	17–21	100–110	Low	Low	Moderate.
CL, CH, MH	A–6, A–7	0.6–2.0	0.10–0.14	5.1–7.3	16–21	100–110	Moderate	Low	Moderate.
ML	A–4	2.0–6.0	0.12–0.16	4.0–5.5	....	....	Low	Low	High.
SM, GC, SC, ML	A–2, A–4	2.0–>6.0	0.08–0.12	4.0–5.5	12–16	115–122	Low	Low	High.
SM, GM, ML	A–2, A–4	2.0–>6.0	0.08–0.12	4.0–5.5	10–14	118–125	Low	Low	High.
GM, ML, CL	A–4	0.6–2.0	0.12–0.16	4.5–6.5	....	....	Low	Moderate	Moderate.
GM, ML, CL	A–4, A–6, A–7	0.6–2.0	0.10–0.14	4.5–5.5	14–16	110–118	Low	Low	Moderate.
GM	A–2, A–4	0.6–6.0	0.06–0.10	4.5–5.5	10–15	115–125	Low	Low	Moderate.
GM, SM	A–2, A–4	0.6–6.0	0.10–0.14	4.5–6.5	....	....	Low	Low	High.
GM, GC, SM, SC	A–2, A–4	0.6–2.0	0.08–0.12	4.0–5.5	10–15	115–125	Low	Low	High.
GM, GC, SM, SC	A–2, A–4	0.2–0.6	0.06–0.10	4.0–5.5	10–14	120–128	Low	Low	High.
SM, GM	A–2, A–4	2.0–6.0	0.04–0.08	4.0–5.0	....	....	Low	Low	High.
SM, GM, GP-GM	A–1, A–2	2.0–6.0	0.02–0.06	4.0–5.0	8–10	120–128	Low	Low	High.
ML, SM, GM, GC	A–2, A–4	2.0–6.0	0.08–0.12	4.5–5.5	....	....	Low	Low	High.
SM, GM	A–2, A–4	0.6–>6.0	0.06–0.10	4.5–5.5	9–13	115–125	Low	Low	High.
ML	A–4	0.6–2.0	0.14–0.18	5.1–7.3	....	....	Low	High	High.
ML, CL	A–4, A–6, A–7	<0.2	0.08–0.12	5.1–7.3	14–20	95–112	Moderate	High	High.
ML	A–4	0.6–2.0	0.14–0.18	4.5–5.5	....	....	Low	Low	High.
ML, CL	A–4	0.6–2.0	0.12–0.16	4.5–5.5	12–15	116–122	Low	Low	High.
ML, CL, SM, GM	A–2, A–4	0.2–0.6	0.08–0.12	4.5–5.5	11–14	118–124	Low	Low	High.
ML, CL	A–4, A–6	0.6–2.0	0.18–0.22	5.6–7.3	16–20	100–112	Moderate	High	Moderate.
ML, CL, SM	A–2, A–4, A–6	0.6–2.0	0.12–0.18	5.6–7.3	16–20	100–112	Low	High	Moderate.
ML	A–4	0.6–2.0	0.18–0.24	4.5–7.3	....	....	Low	Moderate	High.
ML, CL	A–4, A–6	0.2–0.6	0.14–0.18	4.5–6.5	14–18	110–116	Low	High	High.
ML, CL	A–4, A–6	<0.2	0.10–0.14	4.5–6.0	14–18	110–116	Low	High	High.
SM, ML	A–4	0.2–0.6	0.10–0.14	4.5–5.5	12–16	115–122	Low	High	High.

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to— Seasonal high water table	Depth to— Bedrock	Depth from surface of representative profile	USDA texture of representative profile	Coarse fraction greater than 3 inches	Percentage passing sieve— No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)
	Feet	*Feet*	*Inches*		*Percent*				
Murrill: MrB, MrC, MuB, MuC, MvB, MvD, MwA, MwB, MwC.	>3	>6	0–10	Gravelly loam	0–15	75–100	70–100	60–85	40–75
			10–55	Gravelly loam, clay loam.	0–15	75–100	70–100	60–100	55–90
			55–90	Silty clay loam	0–20	70–95	65–95	55–95	55–95
Nolin: No	[1] >3	>5	0–41	Silt loam		95–100	90–100	85–100	70–100
			41–60	Silty clay loam, silty clay.		80–100	80–95	70–90	60–85
Penlaw: Pe	½–1½	3½–6	0–10	Silt loam		95–100	95–100	95–100	85–95
			10–50	Silty clay loam		95–100	95–100	95–100	80–95
			50–61	Silty clay		95–100	95–100	95–100	75–90
Philo: Ph	[1] 1½–3	>6	0–29	Silt loam		95–100	90–100	70–90	55–80
			29–55	Fine sandy loam, gravelly sandy loam.		60–85	50–70	45–60	20–55
Pope: Po	[1] >3	>5	0–31	Loam, silt loam	0–5	75–100	70–100	55–85	40–65
			31–66	Sandy loam	0–5	95–100	90–100	60–70	30–40
Purdy: Pu	0–½	>6	0–7	Silty clay loam		95–100	90–100	90–100	90–100
			7–40	Silty clay loam, silty clay.		95–100	90–100	85–100	70–95
			40–66	Silty clay loam, silty clay.		95–100	90–100	85–95	70–95
Rock outcrop. Properties too variable to estimate.									
Ryder: RyB, RyC, RyD.	>3	2–3½	0–8	Silt loam		85–100	80–100	75–95	65–85
			8–30	Silt loam, channery silt loam.		85–100	80–100	75–95	65–85
			30–36	Very channery silt loam.		30–65	25–55	20–45	15–35
			36	Limestone bedrock.					
Tyler: Ty	½–1½	>6	0–14	Silt loam		95–100	90–100	90–100	85–100
			14–65	Silty clay loam, clay loam, loam.		95–100	90–100	85–95	60–95
Urban land: Ur. Properties too variable to estimate.									
Vanderlip: VaD, VaE.	>3	3½–6	0–10	Cobbly loamy sand	0–25	90–100	75–100	70–100	25–45
			10–65	Loamy sand, cobbly loamy sand, sand.	0–25	90–100	70–100	60–100	20–40
Very stony land, Dekalb soil material: Vd. Properties too variable to estimate.									
Warners: Wa	[1] 0	>6	0–12	Silt loam		95–100	95–100	90–100	60–90
			12–38	Silt loam		70–100	65–100	50–100	40–90
			38–74	Marl		70–100	65–100	50–100	40–90
Weikert: WeB, WeC, WeD, WeF, WkB3, WkC3, WkD3.	>3	1–1½	0–7	Shaly silt loam	0–10	30–70	25–65	25–60	20–55
			7–18	Very shaly silt loam.	0–20	25–55	20–40	10–35	5–25
			18	Shale bedrock.					

[1] Subject to flooding.

significant to engineering—Continued

Engineering classification		Range in permeability	Range in available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential	Corrosion potential for—	
Unified	AASHO							Steel	Concrete
		Inches per hour	*Inches per inch of depth*	*pH*	*Lb per cu ft*	*Percent*			
ML, SM	A-4	0.6–2.0	0.12–0.16	5.1–7.3	....	....	Low	Low	Moderate.
ML, CL, CH, MH	A-4, A-6, A-7	0.6–2.0	0.10–0.14	6.1–7.3	15–22	102–115	Low	Low	Moderate.
ML, CL,	A-4, A-6, A-7	0.6–2.0	0.08–0.12	5.6–6.5	15–25	102–113	Low	Low	Moderate.
ML, CL	A-4, A-6	0.6–2.0	0.16–0.20	5.6–7.3	16–21	100–110	Low	Low	Moderate.
ML, CL	A-4, A-6, A-7	0.6–2.0	0.10–0.14	5.6–6.5	12–16	105–115	Low to moderate.	Low	Moderate.
ML, CL	A-4	0.6–2.0	0.16–0.20	5.6–7.3	....	....	Low	Moderate	High.
ML, CL	A-4, A-6	<0.2	0.08–0.16	5.6–7.3	8–12	110–115	Moderate	Moderate	High.
ML, CL	A-4, A-6	0.2–0.6	0.10–0.14	5.6–7.3	8–12	110–115	Moderate	Moderate	High.
ML	A-4	0.2–2.0	0.14–0.18	5.1–7.3	10–14	110–120	Low	Moderate	Moderate.
SM, ML, GM	A-2, A-4	0.2–2.0	0.06–0.10	5.1–6.0	8–12	115–120	Low	Moderate	Moderate.
ML, SM	A-4	0.6–6.0	0.12–0.16	4.5–6.5	10–14	110–120	Low	Moderate	High.
SM-SC	A-2, A-4	2.0–6.0	0.06–0.10	4.5–5.5	8–12	115–120	Low	Low	High.
ML, CL	A-4, A-6	0.2–0.6	0.18–0.24	4.0–6.5	....	....	Low	High	High.
ML, CL, MH, CH	A-4, A-6, A-7	<0.2	0.10–0.16	4.5–5.5	14–20	104–115	Moderate	High	High.
ML, CL	A-4, A-6, A-7	<0.2	0.10–0.14	4.5–5.5	14–20	105–115	Moderate	High	High.
ML	A-4, A-6	0.6–2.0	0.18–0.22	5.1–7.3	....	....	Low	Moderate	Moderate.
ML, CL	A-4, A-6	0.6–6.0	0.14–0.18	5.1–6.5	18–25	95–115	Low	Moderate	Moderate.
GM, SM, GM-GC	A-1, A-2	0.6–6.0	0.06–0.10	5.1–6.5	18–25	95–115	Low	Moderate	Moderate.
ML, CL, ML-CL	A-4, A-6	0.6–2.0	0.18–0.22	4.5–6.5	....	....	Low	High	High.
ML, CL, CH, ML-CL	A-6, A-7	<0.2	0.10–0.14	4.5–6.0	15–20	105–115	Moderate	High	High.
SM, SC, SM-SC	A-2, A-4, A-6	>6.0	0.08–0.12	4.5–6.0	....	....	Low	Moderate	High.
SM, SC, SP-SM, SP-SW, SM-SC	A-2, A-4	>6.0	0.06–0.10	4.5–6.0	10–15	115–125	Low	Low	High.
ML, CL	A-4, A-6	0.6–2.0	0.18–0.30	6.1–7.8	....	....	Low	High	Low.
ML, CL, SC, SM	A-4, A-6, A-7	<0.2	0.14–0.18	7.4–8.4	16–22	95–106	Moderate	High	Low.
ML, CL, CH, SM	A-4, A-6, A-7, A-5	0.2–2.0	0.16–0.20	7.4–8.4	16–24	95–105	Moderate	High	Low.
GM, ML	A-1, A-2, A-4	2.0–6.0	0.08–0.14	4.5–6.5	....	....	Low	Low	High.
GM, GP-GM	A-1, A-2	2.0–6.0	0.04–0.08	4.5–5.5	12–18	114–120	Low	Moderate	High.

TABLE 9.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil that series that appear in

Soil series and map symbols	Suitability as source of— Topsoil	Sand and gravel	Road fill	Soil features affecting— Highway and road location	Ponds: Reservoir area	Ponds: Embankment
Allegheny: AlB	Fair	Poor: locally good for gravel in substratum.	Fair to good.	Moderate frost heaving potential.	Pervious substratum.	Fair to good compactibility; permeable material in substratum; stable.
Alluvial land: Am. Properties too variable to rate.						
Andover: AnB, AoB.	Fair	Unsuitable	Fair	High water table; moderate frost heaving potential; stoniness; seepage above fragipan.	High water table; pervious substratum in places.	Fair to good stability; low permeability when compacted; poor to good resistance to piping; stoniness.
*Atkins: As. For properties of Melvin soils, see Melvin series.	Fair	Unsuitable	Fair	High water table; high frost heaving potential; flooding hazard.	High water table; pervious substratum in places; flooding hazard.	Poor to fair stability; erodible; low permeability when compacted; fair to good resistance to piping.
Atkins clayey subsoil variant: At.	Poor	Unsuitable	Fair	High water table; moderate to high frost heaving potential; flooding hazard.	High water table; pervious substratum in places; flooding hazard.	Poor stability; erodible.
*Bedington: BcB, BcC, BdB, BdD. For properties of Laidig soils in BdB and BdD, see Laidig series.	Poor	Unsuitable	Fair	Bedrock at a depth of 4 to 6 feet; high frost heaving potential.	Bedrock at a depth of 4 to 6 feet; pervious substratum.	Fair to good stability and compactibility; fair to poor resistance to piping.
Berks: BeB, BeC	Poor	Unsuitable	Fair	Bedrock at a depth of 1½ to 3½ feet; moderate frost heaving potential.	Bedrock at a depth of 1½ to 3½ feet; pervious substratum.	Fair to good stability; poor resistance to piping; permeable when compacted.
Blairton: BlA, BlB.	Fair	Unsuitable	Fair	Seasonal high water table; bedrock at a depth of 1½ to 3½ feet; high frost heaving potential.	Seasonal high water table; bedrock at a depth of 1½ to 3½ feet.	Fair stability; poor resistance to piping.
Brinkerton: BrA, BrB.	Fair	Unsuitable	Poor	High water table; high frost heaving potential; seepage above fragipan.	High water table	Poor to fair stability; fair to poor resistance to piping.
Buchanan: BuB, BuC, BxB, BxD.	Fair	Unsuitable	Fair	Seasonal high water table; moderate frost heaving potential; stoniness; seepage above fragipan.	Seasonal high water table; pervious substratum in places.	Fair to poor stability; fair to poor resistance to piping; slow permeability; stoniness.

interpretations

may have different properties and limitations. It is necessary, therefore, to follow carefully the instructions for referring to other the first column]

Soil features affecting—Continued					
Drainage	Sprinkler Irrigation	Terraces or diversions	Grassed waterways	Winter grading	Pipeline construction and maintenance
Well drained	Features generally favorable.	Features generally favorable.	Features generally favorable.	Features generally favorable.	Features generally favorable.
High water table; stoniness; slow permeability; seepage above fragipan.	High water table; stoniness; slow permeability; drainage needed.	High water table; stoniness; seepage above fragipan.	High water table; stoniness; seepage above fragipan; erodible.	High water table; stoniness; forms large frozen clods.	High water table; stoniness; seepage above fragipan.
High water table; moderate to slow permeability; outlets hard to find; flooding hazard.	High water table; moderate to slow permeability; drainage needed; flooding hazard.	High water table	High water table; flooding hazard.	High water table; flooding hazard; forms large frozen clods.	High water table; flooding hazard; subject to caving.
High water table; moderately slow permeability; outlets hard to find; flooding hazard.	High water table; moderately slow permeability; drainage needed; flooding hazard.	High water table	High water table; flooding hazard.	High water table; forms large frozen clods; flooding hazard.	High water table; subject to caving; flooding hazard.
Well drained	Moderate intake rate; high available water capacity.	Features generally favorable.	Features generally favorable.	Features generally favorable.	Bedrock at a depth of 4 to 6 feet.
Bedrock at a depth of 1½ to 3½ feet; well drained.	Bedrock at a depth of 1½ to 3½ feet; low available water capacity.	Bedrock at a depth of 1½ to 3½ feet.	Bedrock at a depth of 1½ to 3½ feet; low available water capacity.	Features generally favorable.	Bedrock at a depth of 1½ to 3½ feet.
Seasonal high water table; bedrock at a depth of 1½ to 3½ feet; moderate to moderately slow permeability.	Seasonal high water table; bedrock at a depth of 1½ to 3½ feet; moderately slow permeability; drainage needed.	Seasonal high water table; bedrock at a depth of 1½ to 3½ feet.	Seasonal high water table; bedrock at a depth of 1½ to 3½ feet.	Seasonal high water table; forms large frozen clods.	Seasonal high water table; bedrock at a depth of 1½ to 3½ feet.
High water table; seepage above fragipan; slow permeability.	High water table; slow intake rate; slow permeability; drainage needed.	High water table; seepage above fragipan.	High water table; seepage above fragipan.	High water table; forms large frozen clods.	High water table; seepage above fragipan.
Seasonal high water table; seepage above fragipan; slow permeability; stoniness.	Seasonal high water table; slow intake rate; slow permeability; drainage needed; stoniness.	Seasonal high water table; seepage above fragipan; stoniness.	Seasonal high water table; seepage above fragipan; stoniness.	Seasonal high water table; forms large frozen clods; stoniness.	Seasonal high water table; seepage above fragipan.

TABLE 9.—*Engineering*

Soil series and map symbols	Suitability as source of— Topsoil	Sand and gravel	Road fill	Soil features affecting— Highway and road location	Ponds: Reservoir area	Ponds: Embankment
Clarksburg: Ck	Good	Unsuitable	Fair	Seasonal high water table; high frost heaving potential; seepage above fragipan.	Seasonal high water table.	Poor to fair stability and compactibility; fair to poor resistance to piping; slow permeability.
*Dekalb: DeB, DeD, DlF. For properties of Hazleton soils in DeB and DeD and for properties of Lehew soils in DlF, see the Hazleton or Lehew series.	Poor	Poor	Good	Bedrock at a depth of 1½ to 3½ feet; moderate frost heaving potential; stoniness.	Bedrock at a depth of 1½ to 3½ feet; pervious substratum.	Fair to poor resistance to piping; permeable when compacted; stoniness.
Duffield: DsA, DsB, DsC, DsC3.	Good	Unsuitable	Fair to poor.	High frost heaving potential; limestone ledges; sinkholes in places.	Sinkholes and solution channels in limestone bedrock in places.	Fair stability; poor resistance to piping; erodible.
Dunning: Du	Fair	Unsuitable	Poor	High water table; poor stability; high frost heaving potential; flooding hazard.	High water table; flooding hazard.	Poor to fair stability; low permeability when compacted; erodible.
Dunning overwash variant: Dv.	Good	Unsuitable	Fair	Seasonal high water table; high frost heaving potential; flooding hazard.	Seasonal high water table; pervious substratum in places; flooding hazard.	Fair to poor stability; flooding.
Edgemont: EcB, EcC, EdC.	Poor	Poor	Good	Bedrock at a depth of 3½ to 6 feet; moderate frost heaving potential; stoniness.	Bedrock at a depth of 3½ to 6 feet; pervious substratum.	Permeable when compacted; stoniness.
Edom: EeB, EeC	Fair	Unsuitable	Fair	Bedrock at a depth of 3½ to 5 feet; moderate frost heaving potential.	Bedrock at a depth of 3½ to 5 feet; sinkholes in places.	Fair to poor stability.
Edom moderately well drained variant: ElB.	Fair	Unsuitable	Fair	Seasonal high water table; bedrock at a depth of 3½ to 5 feet; moderate frost heaving potential.	Seasonal high water table; bedrock at a depth of 3½ to 5 feet; sinkholes in places.	Fair to poor stability; slow permeability.
Glenville: GlB	Poor	Unsuitable	Fair	Seasonal high water table; high potential frost action; seepage above fragipan.	Seasonal high water table; bedrock at a depth of 4 to 6 feet.	Fair stability; fair to good compactibility; fair resistance to piping.
*Hagerstown: HeA, HeB, HeC, HfB, HgB3, HgC3, HhC3, HhD3, HkB, HkD. Rock outcrop in HkB and HkD is not rated.	Good	Unsuitable	Fair to poor.	Bedrock at a depth of 3½ to 7 feet; moderate to high frost heaving potential; limestone ledges near soil surface; sinkholes.	Bedrock at a depth of 3½ to 7 feet; sinkholes and solution channels in places.	Fair to poor stability; erodible.

interpretations—Continued

Soil features affecting—Continued					
Drainage	Sprinkler Irrigation	Terraces or diversions	Grassed waterways	Winter grading	Pipeline construction and maintenance
Seasonal high water table; seepage above fragipan; slow permeability.	Seasonal high water table; moderately slow intake rate; slow permeability; drainage needed.	Seasonal high water table; seepage above fragipan.	Seasonal high water table; seepage above fragipan.	Seasonal high water table.	Seasonal high water table; seepage above fragipan.
Bedrock at a depth of 1½ to 3½ feet; well drained.	Bedrock at a depth of 1½ to 3½ feet; low available water capacity; stoniness.	Bedrock at a depth of 1½ to 3½ feet; stoniness.	Bedrock at a depth of 1½ to 3½ feet; low available water capacity; stoniness.	Stoniness	Bedrock at a depth of 1½ to 3½ feet; stoniness.
Well drained	Features generally favorable.	Limestone ledges	Limestone ledges	Forms large frozen clods.	Limestone ledges.
High water table; outlets hard to find; slow permeability; flooding hazard.	High water table; slow intake rate; slow permeability; drainage needed; flooding hazard.	High water table; flooding hazard.	High water table; flooding hazard.	High water table; forms large frozen clods; flooding hazard.	High water table; flooding hazard.
Seasonal high water table; flooding hazard.	Seasonal high water table; drainage needed; flooding hazard.	Seasonal high water table.	Seasonal high water table; flooding hazard.	Seasonal high water table; forms large frozen clods; flooding hazard.	Seasonal high water table; flooding hazard.
Well drained; stoniness.	Stoniness	Stoniness	Stoniness	Features generally favorable; stoniness.	Bedrock at a depth of 3½ to 6 feet; stoniness.
Well drained	Moderate available water capacity; slow intake rate.	Bedrock at a depth of 3½ to 5 feet.	Bedrock at a depth of 3½ to 5 feet.	Bedrock at a depth of 3½ to 5 feet; clayey.	Bedrock at a depth of 3½ to 5 feet.
Seasonal high water table; slow permeability.	Seasonal high water table; slow intake rate; slow permeability; drainage needed.	Seasonal high water table; bedrock at a depth of 3½ to 5 feet.	Seasonal high water table; bedrock at a depth of 3½ to 5 feet.	Seasonal high water table; bedrock at a depth of 3½ to 5 feet; clayey.	Seasonal high water table; bedrock at a depth of 3½ to 5 feet.
Seasonal high water table; moderately slow permeability; seepage above fragipan.	Seasonal high water table; moderate intake rate; moderately slow permeability; drainage needed.	Seasonal high water table; seepage above fragipan.	Seasonal high water table; seepage above fragipan.	Seasonal high water table; fair to poor trafficability.	Seasonal high water table; seepage above fragipan.
Well drained	Moderate intake rate.	Bedrock ledges	Bedrock ledges	Bedrock ledges; clayey.	Bedrock at a depth of 3½ to 7 feet; limestone bedrock; clayey.

TABLE 9.—*Engineering*

Soil series and map symbols	Suitability as source of— Topsoil	Sand and gravel	Road fill	Soil features affecting— Highway and road location	Ponds: Reservoir area	Ponds: Embankment
Hazleton ... Mapped only with Dekalb soil in DeB and DeD.	Poor	Poor	Good	Bedrock at a depth of 4 to 6 feet; moderate frost heaving potential; stoniness.	Bedrock at a depth of 4 to 6 feet; pervious substratum.	Permeable when compacted; stoniness.
Highfield: HIB, HIC, HmD, HmF.	Poor	Unsuitable	Fair	Bedrock at a depth of 3½ to 6 feet; moderate frost heaving potential; stoniness.	Bedrock at a depth of 3½ to 6 feet; pervious substratum.	Fair to poor stability and compactibility; fair resistance to piping; stoniness.
Laidig: LaB, LaD, LaE, LdB, LdC.	Poor	Unsuitable	Good	Seepage above fragipan; stoniness.	Pervious substratum in places.	Fair stability; stoniness.
Leetonia: LeB	Poor	Fair	Good	Bedrock at a depth of 2½ to 3½ feet; low frost heaving potential; stoniness.	Bedrock at a depth of 2½ to 3½ feet; permeable material.	Permeable when compacted; stoniness.
Lehew: LhD	Poor	Poor	Good	Bedrock at a depth of 1½ to 3½ feet; moderate frost heaving potential; stoniness.	Bedrock at a depth of 1½ to 3½ feet; permeable material.	Permeable when compacted; stoniness.
Markes: MaB	Poor	Unsuitable	Poor	High water table; bedrock at a depth of 1½ to 3½ feet; high potential frost action.	High water table; bedrock at a depth of 1½ to 3½ feet.	Fair to poor stability and compactibility; poor to fair resistance to piping; slow permeability.
Meckesville: McD.	Poor	Unsuitable	Good	Moderate frost heaving potential; seepage above fragipan; stoniness.	Features generally favorable.	Poor to fair stability; stoniness; piping hazard.
Melvin ... Mapped only with Atkins soil.	Fair	Unsuitable	Poor	High water table; poor stability; high frost heaving potential; flooding hazard.	High water table; flooding hazard.	Poor to fair stability; erodible.
Monongahela: MoB.	Good	Unsuitable	Fair	Seasonal high water table; high frost heaving potential; seepage above fragipan.	Seasonal high water table; pervious substratum in places.	Fair to poor stability; slow permeability.
Murrill: MrB, MrC, MuB, MuC, MvB, MvD, MwA, MwB, MwC.	Poor	Unsuitable	Fair	Moderate frost heaving potential; sinkholes in places; stoniness.	Pervious substratum in places; sinkholes and solution channels.	Fair to poor stability; stoniness.
Nolin: No	Good	Unsuitable	Fair	High frost heaving potential; flooding hazard.	Pervious substratum in places; flooding hazard.	Fair to poor stability; piping hazard.

interpretations—Continued

Soil features affecting—Continued					
Drainage	Sprinkler Irrigation	Terraces or diversions	Grassed waterways	Winter grading	Pipeline construction and maintenance
Well drained; stoniness.	Stoniness	Stoniness	Stoniness	Stoniness	Bedrock at a depth of 4 to 6 feet.
Well drained; stoniness.	Moderate intake rate and permeability; moderate available water capacity; stoniness.	Fair stability; stoniness.	Stoniness	Poor trafficability; stoniness.	Bedrock at a depth of 3½ to 6 feet; stoniness.
Moderately slow permeability; seepage above fragipan; well drained; stoniness.	Moderately slow permeability; stoniness.	Seepage above fragipan; stoniness.	Seepage above fragipan; stoniness.	Stoniness	Seepage above fragipan; stoniness.
Bedrock at a depth of 2½ to 3½ feet; well drained; stoniness.	Bedrock at a depth of 2½ to 3½ feet; low available water capacity; stoniness.	Bedrock at a depth of 2½ to 3½ feet; permeable material; stoniness.	Bedrock at a depth of 2½ to 3½ feet; permeable material; low available water capacity; stoniness.	Stoniness	Bedrock at a depth of 2½ to 3½ feet; stoniness.
Bedrock at a depth of 1½ to 3½ feet; well drained; stoniness.	Bedrock at a depth of 1½ to 3½ feet; low available water capacity; stoniness.	Bedrock at a depth of 1½ to 3½ feet; stoniness.	Bedrock at a depth of 1½ to 3½ feet; low available water capacity; stoniness.	Stoniness	Bedrock at a depth of 1½ to 3½ feet; stoniness.
High water table; bedrock at a depth of 1½ to 3½ feet; slow permeability.	High water table; bedrock at a depth of 1½ to 3½ feet; low available water capacity; slow permeability; drainage needed.	High water table; bedrock at a depth of 1½ to 3½ feet.	High water table; bedrock at a depth of 1½ to 3½ feet; low available water capacity.	High water table	High water table; bedrock at a depth of 1½ to 3½ feet.
Moderately slow permeability; seepage above fragipan; well drained; stoniness.	Moderately slow permeability; stoniness.	Seepage above fragipan; stoniness.	Seepage above fragipan; stoniness.	Forms large frozen clods; stoniness.	Seepage above fragipan; stoniness.
High water table; outlets hard to find; flooding hazard.	High water table; moderately slow intake rate; drainage needed; flooding hazard.	High water table; flooding hazard.	High water table; flooding hazard.	High water table; forms large frozen clods; flooding hazard.	High water table; flooding hazard.
Seasonal high water table; slow permeability; seepage above fragipan.	Seasonal high water table; slow intake rate; slow permeability; drainage needed.	Seasonal high water table; seepage above fragipan.	Seasonal high water table; seepage above fragipan.	Seasonal high water table; forms large frozen clods.	Seasonal high water table; seepage above fragipan.
Well drained; stoniness.	Features generally favorable; stoniness.	Features generally favorable; stoniness.	Features generally favorable; stoniness.	Features generally favorable; stoniness.	Features generally favorable; stoniness.
Well drained; flooding hazard.	Flooding hazard	Well drained	Flooding hazard	Flooding hazard	Flooding hazard.

TABLE 9.—*Engineering*

Soil series and map symbols	Suitability as source of— Topsoil	Sand and gravel	Road fill	Soil features affecting— Highway and road location	Ponds: Reservoir area	Ponds: Embankment
Penlaw: Pe	Good	Unsuitable	Fair	Seasonal high water table; bedrock at a depth of 3½ to 6 feet; high frost heaving potential; seepage above fragipan.	Seasonal high water table; bedrock at a depth of 3½ to 6 feet; sinkholes and solution channels in limestone bedrock in places.	Poor to fair stability and compactibility; fair to poor resistance to piping; slow permeability.
Philo: Ph	Fair	Poor	Fair	Seasonal high water table; high frost heaving potential; stoniness.	Seasonal high water table; pervious substratum in places; flooding hazard.	Fair stability; piping hazard; erodible.
Pope: Po	Good	Poor	Good	Moderate frost heaving potential; flooding hazard.	Pervious substratum in places; permeable material; flooding hazard.	Permeable when compacted; piping hazard.
Purdy: Pu	Fair	Unsuitable	Poor	High water table; high frost heaving potential.	High water table	Fair to poor stability; slow permeability; erodible.
Rock outcrop. Properties too variable to rate.						
Ryder: RyB, RyC, RyD.	Fair	Unsuitable	Fair	Bedrock at a depth of 2 to 3½ feet; sinkholes and solution channels in places; high frost heaving potential.	Bedrock at a depth of 2 to 3½ feet; sinkholes and solution channels in places.	Fair to poor stability; erodible.
Tyler: Ty	Fair	Unsuitable	Poor	Seasonal high water table; poor stability; high frost heaving potential; seepage above fragipan.	Seasonal high water table.	Fair to poor stability; slow permeability; erodible.
Urban land: Ur. Properties too variable to rate.						
Vanderlip: VaD, VaE.	Poor	Unsuitable for gravel; good for sand.	Good	Bedrock at a depth of 3½ to 20 feet.	Permeable material.	Permeable when compacted.
Very stony land: Vd. Properties too variable to rate.						
Warners: Wa	Poor	Unsuitable	Poor	High water table; poor stability; high frost heaving potential; flooding hazard.	High water table; pervious substratum in places; flooding hazard.	Poor to fair stability; high compressibility; slow permeability; erodible.
Weikert: WeB, WeC, WeD, WeF, WkB3, WkC3, WkD3.	Poor	Unsuitable	Good	Bedrock at a depth of 1 to 1½ feet; moderate frost heaving potential.	Bedrock at a depth of 1 to 1½ feet.	Fair stability; shaly material.

interpretations—Continued

Soil features affecting—Continued					
Drainage	Sprinkler Irrigation	Terraces or diversions	Grassed waterways	Winter grading	Pipeline construction and maintenance
Seasonal high water table; slow permeability; seepage above fragipan.	Seasonal high water table; moderately slow intake rate; moderate available water capacity; drainage needed.	Seasonal high water table; seepage above fragipan.	Seasonal high water table; seepage above fragipan.	Seasonal high water table.	Seasonal high water table; bedrock at a depth of 3½ to 6 feet; seepage above fragipan.
Seasonal high water table; moderately slow permeability; flooding hazard.	Seasonal high water table; moderately slow permeability; flooding hazard; drainage needed.	Seasonal high water table; flooding hazard.	Seasonal high water table; flooding hazard.	Seasonal high water table; forms large frozen clods; flooding hazard.	Seasonal high water table; flooding hazard.
Well drained	Flooding hazard	Well drained	Flooding hazard	Flooding hazard	Flooding hazard.
High water table; slow permeability.	High water table; slow intake rate; slow permeability; drainage needed.	High water table	High water table	High water table; forms large frozen clods; clayey.	High water table; clayey.
Bedrock at a depth of 2 to 3½ feet; well drained.	Bedrock at a depth of 2 to 3½ feet; moderate to high available water capacity.	Bedrock at a depth of 2 to 3½ feet; limestone ledges.	Bedrock at a depth of 2 to 3½ feet; limestone ledges.	Limestone ledges; forms large frozen clods.	Bedrock at a depth of 2 to 3½ feet.
Seasonal high water table; seepage above fragipan; slow permeability.	Seasonal high water table; slow permeability; slow intake rate; drainage needed.	Seasonal high water table; seepage above fragipan.	Seasonal high water table; seepage above fragipan.	Seasonal high water table.	Seasonal high water table; seepage above fragipan.
Well drained	Low available water capacity.	Permeable material; erodible in channels.	Low available water capacity; erodible in channels; droughty.	Features generally favorable.	Subject to caving.
High water table; slow permeability; flooding hazard.	High water table; slow permeability; drainage needed; flooding hazard.	High water table	High water table; flooding hazard.	High water table; forms large frozen clods; flooding hazard.	High water table; flooding hazard.
Bedrock at a depth of 1 to 1½ feet; well drained.	Bedrock at a depth of 1 to 1½ feet; low to very low available water capacity.	Bedrock at a depth of 1 to 1½ feet.	Bedrock at a depth of 1 to 1½ feet; low to very low available water capacity.	Features generally favorable.	Bedrock at a depth of 1 to 1½ feet.

semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from the semisolid to the plastic state; and the liquid limit, from the plastic to the liquid state. The *plasticity index* is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

The AASHO and Unified classifications have been explained earlier in the engineering section.

Estimated soil properties significant to engineering

Several estimated soil properties significant to engineering are shown in table 8. These estimates are made for representative soil profiles, by layers sufficiently different to have different significance to soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of the columns in table 8.

Depth to seasonal high water table is distance from the surface of the soil to the highest water level in the soil in most years.

Depth to bedrock is distance from the surface of the soil to the upper surface of the rock layer.

Depth from the surface shows the depth in inches to the significant layers for which properties have been estimated. Those layers are described in the section "Descriptions of the Soils." The estimates of properties of significant layers in succeeding columns are ranges of values for a representative soil profile.

Soil texture, as shown in table 8, is in the standard terms used by the Department of Agriculture. These terms take into account the relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand in an amount of more than about 15 to 20 percent, an appropriate modifier is added, as for example, "gravelly loamy sand."

The coarse fraction, or material greater than 3 inches in diameter, was not measured in the mechanical analysis; it is an estimate made from field observation at the time the sample was collected.

Permeability is that quality of soil that enables it to transmit water or air. It is estimated on the basis of soil characteristics observed in the field, particularly structure and texture. The estimates in table 8 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available moisture capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed as a pH value. The pH value and terms used to describe soil reaction are explained in the Glossary.

Optimum moisture for compaction and maximum dry density have been defined in the section on test data. Estimates are not given for the upper layer where it is thin and consists mainly of surface soil or topsoil.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content; that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material that has this rating.

Corrosion potential pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Rate of corrosion of uncoated steel is related to such soil properties as drainage, texture, total acidity, and electrical conductivity of the soil material. Ratings of soils for corrosivity for concrete are based mainly on soil texture and acidity. Installations that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of *low* means there is a low probability of soil-induced corrosion damage. A rating of *high* means there is a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Engineering interpretations

The interpretations in table 9 are based on the engineering properties of soils shown in table 8, on test data for soils in this survey area and in nearby or adjoining areas, and on the experience of engineers and soil scientists with the soils of Franklin County. In table 9, ratings are used to summarize suitability of the soils as sources of topsoil, sand, gravel, and road fill. For other uses, table 9 lists those soil features not to be overlooked in planning, installing, and maintaining structures. The information in table 9 is reasonably reliable to a depth of about 5 feet for most soils and several more feet for other soils.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as in preparing a seedbed; natural fertility of the material or the response of plants when fertilizer is applied; and absence of substances toxic to plants. Texture of the soil material and its content of stone fragments also affect suitability. Also considered in the ratings is damage that will result at the area from which topsoil is taken.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 9 provide guidance about where to look for probable sources. A soil rated as a *good* or *fair* source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account location of the water table or other factors that affect mining of the materials, and they do not indicate quality of the deposit.

Road fill is soil material used in embankments for roads. The suitability ratings reflect the predicted performance of soil after it has been placed in an embank-

ment that has been properly compacted and provided with adequate drainage and the relative ease of excavating the material at borrow areas.

Soil properties that most affect design and construction of highways and roads are the load-supporting capacity and stability of the subgrade and the workability and quantity of cut and fill material available. The AASHO and Unified classifications of the soil material and the shrink-swell potential indicate traffic-supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill material needed to reach an even grade.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have little seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments require soil material that is resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Large quantities of stone or organic material in a soil are among factors that are unfavorable.

Drainage of cropland and pasture is affected by such soil properties as permeability, texture, and structure; depth to fragipan, rock, or other layers that influence rate of water movement; depth to the water table; slope stability in ditchbanks; susceptibility to flooding; and availability of outlets for drainage.

Irrigation of a soil is affected by such features as slope; susceptibility to flooding, water erosion, or soil blowing; soil texture; depth of root zone; rate of water intake at the surface; permeability of soil layers below the surface layer and in fragipans or other layers that restrict movement of water; amount of water held available to plants; need for drainage; and depth to the water table or bedrock.

Terraces and diversions are embankments, or ridges, constructed across the slope to intercept runoff and seepage so that the water soaks into the soil or flows slowly to a prepared outlet. Soil features that affect construction of terraces are uniformity and steepness of slope; depth to bedrock or other resistant material; number of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

Waterway layout and construction are affected by such soil properties as texture, depth, and erodibility of the soil material; number of stones or rock outcrops; and the steepness of slopes. Other factors that affect waterways are seepage, natural soil drainage, available water capacity, susceptibility to siltation, and the ease of establishing and maintaining vegetation.

Winter grading is affected mainly by such soil features as trafficability, depth to water table, drainage, and plasticity, which are relevant to moving, mixing, and compacting soil in road building when temperatures are below freezing.

Pipeline construction and maintenance are influenced by features of the undisturbed soil, such as slope, depth to bedrock, depth to the water table, stoniness or rockiness, flooding, and corrosion potential.

Descriptions of the Soils[6]

This section describes the soil series and mapping units in Franklin County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is more detailed and is for those who need to make thorough and precise studies of soils. Color terms are for moist soil unless otherwise stated. The profile described in the series is representative of mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Urban land, for example, does not belong to a soil series but, nevertheless, is listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit in which the mapping unit has been placed. The page for the description of each capability unit can be found by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 10. Many of the terms used in describing soils can be found in the Glossary at the back of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*17*).

Some of the soil names and boundaries of the Franklin County detailed soil map do not match those in earlier surveys of Fulton and Adams Counties, Pennsylvania, and Washington County, Maryland. Changes have been made in the concept of some series, differing soil patterns and differing degrees of soil separation have been observed between adjacent areas, and correlations have combined some series.

Allegheny Series

The Allegheny series consists of deep, nearly level to sloping, well-drained, medium-textured soils on terraces

[6] DARRELL G. GRICE, soil correlator, Soil Conservation Service, helped prepare this section.

TABLE 10.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Allegheny loam, 2 to 10 percent slopes	2,550	0.5
Alluvial land	3,440	.7
Andover very stony loam, 0 to 8 percent slopes	1,850	.4
Andover gravelly silt loam, 2 to 8 percent slopes	3,665	.8
Atkins and Melvin silt loams	9,110	1.9
Atkins silty clay loam, clayey subsoil variant	2,615	.6
Bedington channery loam, 3 to 8 percent slopes	8,640	1.8
Bedington channery loam, 8 to 15 percent slopes	2,910	.6
Bedington-Laidig complex, 2 to 8 percent slopes	1,190	.3
Bedington-Laidig complex, 8 to 25 percent slopes	9,165	1.9
Berks shaly silt loam, 2 to 8 percent slopes	24,240	5.0
Berks shaly silt loam, 8 to 15 percent slopes	9,740	2.0
Blairton silt loam, 0 to 3 percent slopes	720	.2
Blairton silt loam, 3 to 8 percent slopes	3,720	.8
Brinkerton silt loam, 0 to 3 percent slopes	3,365	.7
Brinkerton silt loam, 3 to 8 percent slopes	4,330	.9
Buchanan gravelly loam, 2 to 8 percent slopes	9,890	2.0
Buchanan gravelly loam, 8 to 15 percent slopes	780	.2
Buchanan extremely stony loam, 0 to 8 percent slopes	3,135	.6
Buchanan extremely stony loam, 8 to 25 percent slopes	2,630	.5
Clarksburg silt loam	9,605	2.0
Dekalb and Hazleton extremely stony sandy loams, 0 to 8 percent slopes	2,820	.6
Dekalb and Hazleton extremely stony sandy loams, 8 to 25 percent slopes	7,080	1.5
Dekalb and Lehew extremely stony soils, 25 to 75 percent slopes	15,790	3.3
Duffield silt loam, 0 to 3 percent slopes	935	.2
Duffield silt loam, 3 to 8 percent slopes	10,455	2.1
Duffield silt loam, 8 to 15 percent slopes	1,090	.2
Duffield silt loam, 8 to 15 percent slopes, eroded	3,295	.7
Dunning silty clay loam	1,455	.3
Dunning silt loam, overwash variant	1,385	.3
Edgemont channery loam, 3 to 8 percent slopes	475	.1
Edgemont channery loam, 8 to 20 percent slopes	845	.2
Edgemont extremely stony loam, 5 to 20 percent slopes	1,195	.3
Edom silty clay loam, 2 to 8 percent slopes	2,990	.6
Edom silty clay loam, 8 to 15 percent slopes	1,885	.4
Edom silty clay loam, moderately well drained variant, 2 to 8 percent slopes	2,410	.5
Glenville channery silt loam, 3 to 8 percent slopes	935	.2
Hagerstown silt loam, 0 to 3 percent slopes	8,810	1.8
Hagerstown silt loam, 3 to 8 percent slopes	22,785	4.7
Hagerstown silt loam, 8 to 15 percent slopes	1,740	.4
Hagerstown silty clay loam, 2 to 8 percent slopes	19,890	4.1
Hagerstown rocky silty clay loam, 3 to 8 percent slopes, eroded	10,625	2.2
Hagerstown rocky silty clay loam, 8 to 15 percent slopes, eroded	5,470	1.1
Hagerstown silty clay, 8 to 15 percent slopes, eroded	6,795	1.4
Hagerstown silty clay, 15 to 25 percent slopes, eroded	1,420	.3
Hagerstown-Rock outcrop complex, 0 to 8 percent slopes	6,620	1.4
Hagerstown-Rock outcrop complex, 8 to 30 percent slopes	8,735	1.8
Highfield channery silt loam, 3 to 8 percent slopes	3,120	.6
Highfield channery silt loam, 8 to 15 percent slopes	1,075	.2
Highfield extremely stony silt loam, 8 to 25 percent slopes	1,225	.3
Highfield extremely stony silt loam, 25 to 70 percent slopes	550	.1
Laidig extremely stony sandy loam, 0 to 8 percent slopes	3,770	.8
Laidig extremely stony sandy loam, 8 to 25 percent slopes	21,650	4.5
Laidig extremely stony sandy loam, 25 to 45 percent slopes	9,170	1.9
Laidig gravelly loam, 3 to 8 percent slopes	3,980	.8
Laidig gravelly loam, 8 to 15 percent slopes	5,840	1.2
Leetonia extremely stony loamy sand, 0 to 12 percent slopes	2,285	.5
Lehew extremely stony loam, 8 to 25 percent slopes	1,080	.2
Markes shaly silt loam, 2 to 8 percent slopes	4,845	1.0
Meckesville extremely stony loam, 8 to 25 percent slopes	5,920	1.2
Monongahela silt loam, 3 to 8 percent slopes	1,725	.4
Murrill gravelly sandy loam, 3 to 8 percent slopes	5,270	1.0
Murrill gravelly sandy loam, 8 to 15 percent slopes	2,190	.5
Murrill cobbly sandy loam, 3 to 8 percent slopes	2,470	.5
Murrill cobbly sandy loam, 8 to 15 percent slopes	3,690	.8
Murrill extremely stony sandy loam, 0 to 8 percent slopes	1,655	.3
Murrill extremely stony sandy loam, 8 to 25 percent slopes	2,185	.5
Murrill gravelly loam, 0 to 3 percent slopes	1,495	.3
Murrill gravelly loam, 3 to 8 percent slopes	12,910	2.7
Murrill gravelly loam, 8 to 15 percent slopes	3,975	.8
Nolin silt loam, local alluvium	6,295	1.3
Penlaw silt loam	1,650	.3
Philo silt loam	5,130	1.0
Pope soils	760	.1
Purdy silty clay loam	2,025	.4
Ryder silt loam, 3 to 8 percent slopes	1,930	.4
Ryder silt loam, 8 to 15 percent slopes	2,460	.5
Ryder silt loam, 15 to 25 percent slopes	1,420	.3
Tyler silt loam	1,255	.3
Urban land	2,255	.5
Vanderlip cobbly loamy sand, 0 to 25 percent slopes	1,180	.3
Vanderlip cobbly loamy sand, 25 to 50 percent slopes	635	.1
Very stony land, Dekalb soil material	22,435	4.7
Warners silt loam	1,140	.2
Weikert shaly silt loam, 2 to 8 percent slopes	13,095	2.7
Weikert shaly silt loam, 8 to 15 percent slopes	11,275	2.3
Weikert shaly silt loam, 15 to 25 percent slopes	9,220	1.9
Weikert shaly silt loam, 25 to 70 percent slopes	10,540	2.2
Weikert very shaly silt loam, 3 to 8 percent slopes, eroded	4,115	.9
Weikert very shaly silt loam, 8 to 15 percent slopes, eroded	8,555	1.8
Weikert very shaly silt loam, 15 to 25 percent slopes, eroded	5,930	1.2
Miscellaneous (water, quarries, etc.)	1,965	.4
Total	482,560	100.0

and alluvial fans. These soils formed in old loamy stream deposits washed from uplands underlain by shale and sandstone.

In a representative profile in a cultivated area, the plow layer is dark-brown loam about 9 inches thick. The subsoil extends to a depth of 30 inches. It is dark yellowish-brown, friable clay loam and yellowish-brown, firm sandy clay loam. The substratum to a depth of about 48 inches is yellowish-brown, friable sandy loam.

Allegheny soils are moderately permeable and high in available moisture capacity. They have few limitations for most uses. Most of the acreage has been cleared and is used for crops, hay, or pasture.

Representative profile of Allegheny loam, 2 to 10 percent slopes, in a cultivated field 1½ miles southeast of Roxbury along Conondoguinet Creek:

Ap—0 to 9 inches, dark-brown (10YR 4/3) loam; weak, very fine, granular structure; very friable, slightly sticky and slightly plastic; 5 percent coarse fragments; medium acid; clear, wavy boundary.

B21t—9 to 24 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, patchy clay films; 5 percent coarse fragments; strongly acid; clear, wavy boundary.

B22t—24 to 30 inches, yellowish-brown (10YR 5/6) sandy clay loam; moderate, medium, subangular blocky structure; friable to firm, slightly sticky and slightly plastic; thin, discontinuous clay films on ped faces; 5 percent coarse fragments; strongly acid; clear, smooth boundary.

C—30 to 48 inches, yellowish-brown (10YR 5/6) sandy loam; weak, medium, subangular blocky structure; friable, nonsticky and nonplastic; 10 percent coarse fragments; very strongly acid.

The solum ranges from 30 to 40 inches in thickness, and bedrock is at a depth of 4 to 10 feet or more. The Ap, B21t, and B22t horizons range from 0 to 10 percent coarse fragments. The B horizon ranges from 20 to 30 inches in thickness and from strongly acid to very strongly acid in reaction. The Bt horizon ranges from dark yellowish brown to strong brown and from silt loam to sandy clay loam or clay loam. The C horizon is strongly acid to extremely acid.

Allegheny soils are associated on the landscape with the deep, moderately well drained Monongahela soils; the deep, somewhat poorly drained Tyler soils; and the deep, poorly drained to very poorly drained Purdy soils on terraces. They are better drained than those soils.

Allegheny loam, 2 to 10 percent slopes (AlB).—This soil has medium runoff. Included in mapping were a few areas of gravelly soils and a few areas where the surface layer is sandy.

This soil is suited to most crops commonly grown in the county and to trees and wildlife habitat. Slope is the main limitation for most uses. Capability unit IIe–2.

Alluvial Land

Alluvial land (Am) consists of areas of unconsolidated alluvium on narrow flood plains. It is generally stratified and varies in texture, depth, reaction, drainage, and degree of stoniness. It formed in stream deposits on uplands underlain by calcareous and noncalcareous material.

Included with this unit in mapping were small areas of Atkins, Pope, Philo, and Melvin soils.

Alluvial land is better suited to pasture, trees, and wildlife habitat than to crops. The hazard of flooding, stoniness, and a high water table are limitations. Capability unit VIw–1.

Andover Series

The Andover series consists of deep, nearly level and gently sloping, poorly drained, medium-textured soils. These soils are on benches and concave foot slopes and in swales on uplands. They formed in loamy colluvium weathered from shale and sandstone.

In a representative profile in a cultivated area, the plow layer is very dark grayish-brown gravelly silt loam about 8 inches thick. The subsoil extends to a depth of 46 inches. It is gray and grayish-brown, firm and very firm gravelly loam and gravelly clay loam mottled with light gray, very dark grayish brown, light yellowish brown, and yellowish brown to a depth of 19 inches and grayish-brown, very firm and brittle gravelly clay loam mottled with strong brown and gray in the lower part. The substratum to a depth of 58 inches is brown, firm gravelly sandy clay loam mottled with light gray and dark yellowish brown.

Andover soils are slowly permeable and moderate in available moisture capacity. The water table is at or near the surface most of the year. The high water table and stoniness are the main limitations. Some of the acreage is wooded, and some areas have been cleared and are used for pasture and hay.

Representative profile of Andover gravelly silt loam, 2 to 8 percent slopes, in an idle field 2¾ miles northeast of Amberson:

Ap—0 to 8 inches, very dark grayish-brown (2.5Y 3/2) gravelly silt loam; few, fine, faint, gray (10YR 6/1) mottles; weak, fine, granular structure; friable, slightly sticky and slightly plastic; 15 percent coarse fragments; very strongly acid; abrupt, smooth boundary.

B21gt—8 to 14 inches, gray (10YR 5/1) gravelly loam; common, medium, distinct, gray (10YR 6/1) and very dark grayish-brown (10YR 3/2) mottles; weak, medium, prismatic structure parting to weak, fine, subangular blocky; firm, slightly sticky and slightly plastic; thin, continuous clay films on ped faces; 15 percent coarse fragments; very strongly acid; clear, wavy boundary.

B22gt—14 to 19 inches, grayish-brown (10YR 5/2) gravelly clay loam; many, coarse, distinct, yellowish-brown (10YR 5/8) and light yellowish-brown (10YR 6/4) mottles; weak, medium, prismatic structure parting to weak, fine, subangular blocky; firm, slightly sticky and slightly plastic; thin, continuous clay films on ped faces; 15 percent coarse fragments; very strongly acid; clear, wavy boundary.

Bxg—19 to 46 inches, grayish-brown (10YR 5/2) gravelly clay loam; many, coarse, distinct, strong-brown (7.5YR 5/6) and gray (10YR 6/1) mottles; moderate, very coarse, prismatic structure parting to weak, medium, platy; very firm and brittle, slightly sticky and slightly plastic; few, thin, continuous clay films on ped faces; 20 percent coarse fragments; very strongly acid; gradual, wavy boundary.

Cg—46 to 58 inches, brown (7.5YR 5/2) gravelly sandy clay loam; common, medium, distinct, light-gray (N 7/0) and dark yellowish-brown (10YR 4/4) mottles; weak, coarse, prismatic structure; firm, slightly sticky and slightly plastic; 25 percent coarse fragments; very strongly acid.

The solum ranges from 42 to 54 inches in thickness, and bedrock is at a depth of 4 to 8 feet. Depth to the fragipan ranges from 18 to 28 inches. The Ap horizon ranges from 15 to 25 percent coarse fragments. The B horizon ranges from gray to dark grayish brown and is 10 to 30 percent coarse fragments. The Bt horizon is loam, sandy clay loam, or clay loam. The C horizon ranges from 10 to 40 percent coarse fragments.

Andover soils are associated on the landscape with the well drained Laidig soils and the moderately well drained to somewhat poorly drained Buchanan soils. The well-drained Bedington, Berks, Dekalb, Hazleton, and Weikert soils are on nearby uplands. In contrast with all of those soils, Andover soils are poorly drained.

Andover very stony loam, 0 to 8 percent slopes (AnB).—This soil has a profile similar to the one described as representative of the series, but the surface layer is loam that is 1 to 3 percent stones 10 inches to 4 feet in diameter. Runoff is slow.

Included with this soil in mapping were a few small areas of very poorly drained, stony soils.

This soil is better suited to woodland or wildlife habitat than to other uses. The high water table, slow permeability, and stoniness are the main limitations for most uses. Capability unit VIIs-2.

Andover gravelly silt loam, 2 to 8 percent slopes (AoB).—This soil has the profile described as representative of the series. Runoff is slow.

Included with this soil in mapping were some areas of Buchanan soils that have a cobbly surface layer.

Unless this Andover soil is drained, it is too wet for crops. It can be used for pasture and hay if it is carefully managed. Artificial drainage increases suitability for crops. The high water table and slow permeability are the main limitations for most uses. Capability unit IVw-1.

Atkins Series

The Atkins series consists of deep, nearly level, poorly drained, medium-textured soils on flood plains. These soils formed in stream deposits washed from uplands underlain by shale and sandstone.

In a representative profile in a cultivated area, the plow layer is gray and grayish-brown silt loam about 9 inches thick. The subsoil extends to a depth of 48 inches. It is gray, friable silt loam mottled with dark grayish brown and grayish brown to a depth of 22 inches and gray, friable and firm light silty clay loam mottled with grayish brown, yellowish brown, strong brown, and brown in the lower part. The substratum to a depth of about 58 inches is gray, firm light silty clay loam and silt loam mottled with dark yellowish brown, yellowish brown, light brownish gray, and dark grayish brown.

Atkins soils are moderately permeable to slowly permeable and high in available moisture capacity. A water table is at or near the surface most of the year. Flooding and the high water table are the main limitations. Most of the acreage has been cleared and is used for pasture or hay. A few areas are idle or wooded.

Representative profile of Atkins silt loam in a pastured area of Atkins and Melvin silt loams, one-fourth mile northeast of Amberson along Conococheague Creek:

Ap1—0 to 3 inches, gray (10YR 5/1) silt loam; weak, fine, granular structure; friable, nonsticky and nonplastic; strongly acid; clear, wavy boundary.

Ap2—3 to 9 inches, grayish-brown (10YR 5/2) silt loam; few, fine, faint, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; friable, nonsticky and nonplastic; strongly acid; gradual, smooth boundary.

B1g—9 to 22 inches, gray (10YR 6/1) silt loam; few, fine, faint, dark grayish-brown (10YR 4/2) and grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; strongly acid; gradual, wavy boundary.

B2g—22 to 34 inches, gray (10YR 6/1) light silty clay loam; many, fine, distinct, grayish-brown (10YR 5/2), yellowish-brown (10YR 5/6), and strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; friable, sticky and plastic; very strongly acid; gradual, wavy boundary.

B3g—34 to 48 inches, gray (N 6/0) light silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) and brown (10YR 5/3) mottles; moderate, medium, subangular blocky structure; firm, sticky and plastic; very strongly acid; gradual, wavy boundary.

C1g—48 to 55 inches, gray (N 6/0) light silty clay loam; many, medium, distinct, dark yellowish-brown (10YR 4/4), yellowish-brown (10YR 5/6), and light brownish-gray (10YR 6/2) mottles; moderate, medium, subangular blocky structure; firm, slightly sticky and slightly plastic; very strongly acid; clear, wavy boundary.

IICg—55 to 58 inches, gray (10YR 5/1) silt loam; common, medium, distinct, dark grayish-brown (10YR 4/2) mottles; moderate, medium, subangular blocky structure; firm, slightly sticky and slightly plastic; 10 percent coarse fragments; very strongly acid.

The solum ranges from 30 to 50 inches in thickness. The Ap horizon ranges from light gray to dark grayish brown. The Ap2 horizon has mottles that range from dark yellowish brown to yellowish red. The B horizon ranges from gray to light gray. The B and C horizons are strongly acid or very strongly acid. The C horizon is weakly stratified and ranges from light silty clay loam to sandy loam.

Atkins soils are associated on the landscape with the well drained Pope soils, the moderately well drained Philo soils, and the very poorly drained Atkins clayey subsoil variant on flood plains. They are not so well drained as the Pope soils, are wetter than the Philo soils, and are better drained than the Atkins clayey subsoil variant.

Atkins and Melvin silt loams (As).—These soils are nearly level. Some areas of this mapping unit are Atkins soil, some are Melvin soil, and some are both. Throughout the county streams drain both acid shale uplands and limestone uplands, and reaction of the soils varies depending on the source of the streams. These soils have the profiles described as representative of the Atkins and Melvin series.

Included with these soils in mapping were small areas where the surface layer is black silty clay loam and the subsoil is silty clay and a few areas where the surface layer is gravelly sandy loam.

These soils are better suited to crops tolerant of wetness than to other crops (fig. 19), and they are suited to trees and wildlife habitat. Where adequate outlets are available, artificial drainage increases suitability for crops. The hazard of flooding and the high water table are the main limitations for most uses. Capability unit IIIw-1.

Figure 19.—Typical landscape of Atkins and Melvin loams on flood plains.

Atkins Series, Clayey Subsoil Variant

The Atkins series, clayey subsoil variant, consists of deep, nearly level, very poorly drained, moderately fine textured soils on flood plains. These soils formed in stream deposits washed from uplands underlain by shale and sandstone.

In a representative profile in a cultivated area, the surface layer is dark-gray silty clay loam about 7 inches thick. The subsoil extends to a depth of about 36 inches. It is dark-gray, firm silty clay and silty clay loam mottled with dark yellowish brown throughout and with yellowish brown in the lower part. The substratum extends to a depth of 52 inches and is gray, firm sandy clay loam and gravelly sandy clay loam mottled with yellowish brown. Shale bedrock is at a depth of about 52 inches.

Atkins clayey subsoil variant soils are moderately slowly permeable and high in available moisture capacity. A high water table is near the surface during most of the year. Flooding and the high water table are the main limitations for most uses. Most of the acreage has been cleared and is used for pasture or hay.

Representative profile of Atkins silty clay loam, clayey subsoil variant, in a pasture 1.4 miles northwest of Marion along Conococheague Creek:

A11—0 to 1 inch, dark-gray (N 4/0) silty clay loam; weak, fine, granular structure; friable, slightly sticky and slightly plastic; strongly acid; abrupt, wavy boundary.

A12—1 to 7 inches, dark-gray (5Y 4/1) silty clay loam; few, fine, faint, dark yellowish-brown (10YR 4/4) mottles; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; strongly acid; clear, smooth boundary.

B21g—7 to 13 inches, dark-gray (N 4/0) silty clay; few, fine, faint, dark yellowish-brown (10YR 4/4) mottles; moderate, medium, subangular blocky structure; firm, sticky and plastic; strongly acid; gradual, wavy boundary.

B22g—13 to 30 inches, dark-gray (N 4/0) silty clay; common, medium, distinct, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/8) mottles; massive; firm, sticky and very plastic; strongly acid; gradual, wavy boundary.

B23g—30 to 36 inches, dark-gray (N 4/0) silty clay loam; common, coarse, distinct, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) mottles; massive; firm, sticky and very plastic; 5 percent coarse fragments; strongly acid; clear, wavy boundary.

C1g—36 to 46 inches, gray (N 6/0) sandy clay loam; few, coarse, distinct, yellowish-brown (10YR 5/8) mot-

tles; massive; firm, slightly sticky and plastic; few, thin, patchy clay films in pores; 10 percent coarse fragments; strongly acid; gradual, wavy boundary.

C2g—46 to 52 inches, gray (N 6/0) gravelly sandy clay loam; moderate, medium, blocky structure; firm, slightly sticky and slightly plastic; 20 percent coarse fragments; strongly acid.

R—52 inches, shale bedrock.

The solum ranges from 30 to 50 inches in thickness. The A11 and A12 horizons range from black to gray. The B horizon ranges from gray to dark grayish brown and from silty clay loam to clay. The C horizon ranges from gravelly sandy clay loam to silty clay.

The Atkins clayey subsoil variant is associated on the landscape with the well drained Pope soils, the moderately well drained Philo soils, and the poorly drained Atkins soils on flood plains. It is wetter than the Philo and Atkins soils and is not so well drained as the Pope soils.

Atkins silty clay loam, clayey subsoil variant (At).—This soil is nearly level.

Included with this soil in mapping were small areas where the surface layer is silt loam or mucky silty clay loam and a few areas of somewhat poorly drained soils. Also included was an area about 185 acres in size, in the southeastern part of the county, where the surface layer is black silty clay loam and the subsoil is greenish-gray sandy clay.

Unless this Atkins soil is drained, it is too wet for most crops. It is suited to hay, pasture, trees, and wildlife habitat. Where adequate outlets are available, artificial drainage increases suitability for crops. The hazard of flooding and the high water table are limitations for most uses. Capability unit IVw-2.

Bedington Series

The Bedington series consists of deep, nearly level to moderately steep, well-drained, medium-textured soils on dissected uplands. These soils formed in material weathered from shale.

In a representative profile in a cultivated area, the plow layer is dark-brown channery loam about 10 inches thick. The subsoil extends to a depth of 42 inches. It is brown, friable channery silt loam to a depth of 16 inches and strong-brown, friable and firm channery silt loam in the lower part. The substratum to a depth of 66 inches is strong-brown and brownish-yellow very channery silt loam and very channery silty clay loam.

Bedington soils are moderately permeable to moderately rapidly permeable and high in available moisture capacity. The hazard of erosion and the slope are the main limitations. Most of the acreage has been cleared and is used for crops, and a few areas are used for fruit trees.

Representative profile of Bedington channery loam, 3 to 8 percent slopes, in a cultivated field one-sixth mile north of Rocky Springs in Letterkenny Township:

Ap—0 to 10 inches, dark-brown (7.5YR 4/2) channery loam; weak, medium and coarse, granular structure; friable, nonsticky and nonplastic; 15 percent coarse fragments; very strongly acid; clear, smooth boundary.

B21t—10 to 16 inches, brown (7.5YR 5/4) channery silt loam; moderate, coarse, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, discontinuous clay films on ped faces; 20 percent coarse fragments; very strongly acid; clear, smooth boundary.

B22t—16 to 22 inches, strong-brown (7.5YR 5/8) channery silt loam; moderate, coarse, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, discontinuous clay films on ped faces; 25 percent coarse fragments; very strongly acid; gradual, wavy boundary.

B23t—22 to 42 inches, strong-brown (7.5YR 5/8) channery silt loam; moderate, coarse, subangular blocky structure; firm, slightly sticky and plastic; thin, continuous clay films on ped faces; 30 percent coarse fragments; very strongly acid; gradual, wavy boundary.

C1—42 to 48 inches, strong-brown (7.5YR 5/8) very channery silt loam; strong, coarse, subangular blocky structure; firm, slightly sticky and plastic; 65 percent coarse fragments; few, thin, patchy clay films on coarse fragments; very strongly acid; gradual, wavy boundary.

C2—48 to 66 inches, brownish-yellow (10YR 6/6) very channery silty clay loam that has a few, fine, distinct streaks of pale yellow (5Y 8/4); strong, coarse, subangular blocky structure; very firm, slightly sticky and plastic; 70 percent coarse fragments; very strongly acid.

The solum ranges from 40 to 60 inches in thickness, and bedrock is at a depth of 4 to 6 feet or more. The Ap horizon ranges from dark grayish brown to brown and is 15 to 25 percent coarse fragments. The B21t, B22t, and B23t horizons range from red to strong brown and from channery loam to shaly silt loam. The B22t, B23t, and C horizons range from strongly acid to extremely acid.

Bedington soils are associated on the landscape with the moderately deep, well drained Berks soils; the deep, well drained Laidig soils; the deep, moderately well drained to somewhat poorly drained Buchanan soils; the deep, poorly drained Brinkerton soils; and the moderately deep, somewhat poorly drained to moderately well drained Blairton soils. Bedington soils do not have the Bx horizon that is characteristic of the Laidig soils; they are deeper than the Berks soils; and they are better drained than the Buchanan, Brinkerton, and Blairton soils.

Bedington channery loam, 3 to 8 percent slopes (BcB).—This soil has the profile described as representative of the series. Runoff is medium.

Included with this soil in mapping were a few areas of moderately well drained and somewhat poorly drained soils at the heads of drainageways and a few areas where the surface layer is sandy or gravelly silt loam. Also included, near South Mountain, was an area of a soil that contains more sand and less clay throughout the profile and is underlain by metamorphosed shale.

This Bedington soil is suited to most crops commonly grown in the county and to trees and wildlife habitat. Coarse fragments are limitations for some uses. Capability unit IIe-2.

Bedington channery loam, 8 to 15 percent slopes (BcC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is about 3 inches thinner. Runoff is medium.

Included with this soil in mapping were a few areas where the surface layer is sandy or gravelly silt loam. Also included, near South Mountain, was an area of a soil that contains more sand and less clay throughout the profile and is underlain by metamorphosed shale.

This soil is suited to most crops commonly grown in

the county and to trees and wildlife habitat. Coarse fragments and slope are limitations for most uses. Capability unit IIIe-2.

Bedington-Laidig complex, 2 to 8 percent slopes (BdB).—Bedington soils make up about 55 percent of this complex, and Laidig soils about 45 percent. These soils have profiles similar to those described as representative of the Bedington and Laidig series, but the surface layer ranges from channery silt loam to cobbly loam. Runoff is medium.

Included with these soils in mapping were a few small areas that have lost nearly all of the original surface layer, and also a few areas of stony soils.

These soils are suited to most crops commonly grown in the county and to trees and wildlife habitat. Coarse fragments are limitations for some uses. Capability unit IIIs-1.

Bedington-Laidig complex, 8 to 25 percent slopes (BdD).—Bedington soils make up about 65 percent of this complex, and Laidig soils about 35 percent. These soils have profiles similar to those described as representative of the Bedington and Laidig series, but the surface layer ranges from cobbly loam to channery silt loam. Runoff is medium.

Included with these soils in mapping were a few small areas of soils that have lost nearly all of the original surface layer and a few areas of stony soils. Also included, near South Mountain, was an area of a soil that contains more sand and less clay throughout the profile.

These soils are better suited to crops that require limited tillage and to hay, pasture, trees, and wildlife habitat than they are to other uses. Slope and coarse fragments are the main limitations for most uses. Capability unit IVs-2.

Berks Series

The Berks series consists of moderately deep, nearly level to sloping, well-drained, medium-textured soils on rounded and dissected uplands. These soils formed in material weathered from shale, siltstone, and fine-grained sandstone.

In a representative profile in a cultivated area, the plow layer is dark-brown shaly silt loam about 10 inches thick. The subsoil extends to a depth of 26 inches. It is brown, friable very shaly loam. The substratum extends to a depth of 36 inches and is light olive-brown very shaly loam. Weathered shale bedrock is at a depth of about 36 inches.

Berks soils are moderately permeable to rapidly permeable and low in available moisture capacity. Depth to bedrock and slope are the main limitations. Most of the acreage has been cleared and is used for crops. A few areas are wooded.

Representative profile of Berks shaly silt loam, 8 to 15 percent slopes, in a cultivated field 1½ miles southeast of Freys:

Ap—0 to 10 inches, dark-brown (10YR 4/3) shaly silt loam; weak, fine, granular structure; friable, slightly sticky and slightly plastic; 20 percent coarse fragments; slightly acid; abrupt, smooth boundary.

B21—10 to 18 inches, brown (7.5YR 5/4) very shaly loam; moderate, fine, subangular blocky structure; friable, slightly sticky and nonplastic; few, thin, patchy clay films on ped faces; 60 percent coarse fragments; strongly acid; gradual, irregular boundary.

B22—18 to 26 inches, brown (7.5YR 5/4) very shaly loam; weak, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; 75 percent coarse fragments; strongly acid; gradual, irregular boundary.

C—26 to 36 inches, light olive-brown (2.5Y 5/4) very shaly loam; moderate, coarse, platy structure; friable, slightly sticky and nonplastic; 80 percent coarse fragments; very strongly acid; gradual, irregular boundary.

R—36 inches, weathered shale bedrock.

The solum ranges from 20 to 36 inches in thickness, and bedrock is at a depth of 1½ to 3½ feet. The Ap horizon ranges from dark brown to brown and is 15 to 45 percent coarse fragments. The B21t and B22t horizons range from yellowish brown to strong brown and from silt loam to loam. They are 35 to 75 percent coarse fragments.

Berks soils are associated on the landscape with the deep, well drained Bedington soils; the moderately deep, somewhat poorly drained to moderately well drained Blairton soils; the shallow, well drained Weikert soils; and the moderately deep, poorly drained Markes soils. Berks soils are not so deep as the Bedington soils; they are better drained than the Blairton and Markes soils; and they are deeper than the Weikert soils.

Berks shaly silt loam, 2 to 8 percent slopes (BeB).—This soil has a profile similar to the one described as representative of the series, but it contains fewer coarse fragments. Runoff is medium.

Included with this soil in mapping were small areas of Blairton soils, small narrow streaks of Weikert soils, some areas of Berks soils that have a surface layer of shaly loam, and some soils that have bedrock at a depth of more than 40 inches. Also included, in the area of South Mountain, was a soil that is similar to this Berks soil but contains more sand and less clay throughout the profile and is underlain by metamorphosed shale.

This soil is suited to most crops commonly grown in the county and to trees or wildlife habitat. Depth to bedrock and coarse fragments are the main limitations for many uses. Capability unit IIe-6.

Berks shaly silt loam, 8 to 15 percent slopes (BeC).—This soil has the profile described as representative of the series. Runoff is medium.

Included with this soil in mapping were small areas of somewhat poorly drained and moderately well drained soils and some areas of Berks soils that have a surface layer of silty clay loam. Also included, in the area of South Mountain, was a soil that is similar to this Berks soil but contains more sand and less clay throughout the profile and is underlain by metamorphosed shale.

This soil is suited to most crops commonly grown in the county and to trees and wildlife habitat. Depth to bedrock, coarse fragments, and slope are limitations for many uses. Capability unit IIIe-5.

Blairton Series

The Blairton series consists of moderately deep, nearly level and gently sloping, somewhat poorly drained to moderately well drained, medium-textured soils. These soils are on upland flats and depressions and at

the heads of streams. They formed in material weathered from noncalcareous gray shales.

In a representative profile in a cultivated area, the plow layer is dark grayish-brown silt loam about 9 inches thick. The subsoil extends to a depth of 34 inches. It is yellowish-brown, friable silt loam to a depth of 14 inches and yellowish-brown and light brownish-gray, firm and friable shaly silty clay loam and shaly silt loam mottled with light brownish gray, strong brown, yellowish brown, and gray in the lower part. The substratum extends to a depth of 38 inches and is grayish-brown very shaly loam. Shale bedrock is at a depth of about 38 inches.

Blairton soils are moderately slowly permeable to moderately permeable and moderate in available moisture capacity. A seasonal high water table rises to within ½ foot to 3 feet of the surface during wet periods. The seasonal high water table, moderately slow permeability, and depth to bedrock are the main limitations. Most of the acreage has been cleared and is used for crops, and a few areas are wooded.

Representative profile of Blairton silt loam, 3 to 8 percent slopes, in a cultivated field 1 mile southeast of Saint Thomas along Route T460:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable, slightly sticky and slightly plastic; 5 percent coarse fragments; strongly acid; abrupt, smooth boundary.

B21t—9 to 14 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; common, thin, patchy clay films on ped faces and in pores; 10 percent coarse fragments; strongly acid; clear, wavy boundary.

B22t—14 to 26 inches, yellowish-brown (10YR 5/6) shaly silty clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/6) mottles; moderate, medium, blocky structure; firm, sticky and plastic; common, thin, patchy clay films on ped faces and in pores; 20 percent coarse fragments; strongly acid; clear, wavy boundary.

B3g—26 to 34 inches, light brownish-gray (2.5Y 6/2) shaly silt loam; many, medium, distinct, yellowish-brown (10YR 5/4), gray (N 5/0), and strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; few dark coatings on ped faces; 40 percent coarse fragments; very strongly acid; gradual, wavy boundary.

Cg—34 to 38 inches, grayish-brown (10YR 5/2) very shaly loam; many, coarse, distinct, gray (N 6/0) and yellowish-brown (10YR 5/4) mottles and streaks; massive; 95 percent coarse fragments; very strongly acid; clear, irregular boundary.

R—38 inches, noncalcareous shale bedrock.

The solum ranges from 20 to 40 inches in thickness, and bedrock is at a depth of 1½ to 3½ feet. The Ap horizon ranges from very dark brown to olive brown. The B21t, B22t, and B3g horizons range from loam to silty clay loam. The C horizon, which is absent in places, ranges from loam to silt loam.

Blairton soils are associated on the landscape with the moderately deep, well-drained Berks soils; the moderately deep, poorly drained Markes soils; the deep, poorly drained Brinkerton soils; the deep, well-drained Bedington soils; and the shallow, well-drained Weikert soils. Blairton soils are wetter than the Berks and Bedington soils; they are better drained than the Markes and Brinkerton soils; and they are deeper than the Weikert soils.

Blairton silt loam, 0 to 3 percent slopes (BlA).—This soil has a profile similar to the one described as representative of the series, but the surface layer is about 2 inches thicker. Runoff is medium.

Included with this soil in mapping were small areas of poorly drained soils and a few areas where shale bedrock is at a depth of more than 40 inches.

This soil is suited to hay, pasture, and other crops tolerant of some wetness. It is well suited to trees and wildlife habitat. Artificial drainage increases suitability for crops. Moderately slow permeability, depth to bedrock, and the seasonal high water table are the main limitations for most uses. Capability unit IIIw-2.

Blairton silt loam, 3 to 8 percent slopes (BlB).—This soil has the profile described as representative of the series. Runoff is medium.

Included with this soil in mapping were some small areas where shale bedrock is at a depth of less than 20 inches and a few small areas of Bedington soils.

This Blairton soil is suited to crops tolerant of some wetness and to hay, pasture, trees, and wildlife habitat. Artificial drainage increases suitability for crops. The seasonal high water table, depth to bedrock, and moderately slow permeability are limitations for most uses. Capability unit IIIw-2.

Brinkerton Series

The Brinkerton series consists of deep, nearly level and gently sloping, poorly drained, medium-textured soils on concave foot slopes in uplands. These soils formed in colluvial material derived from acid shale and sandstone.

In a representative profile in a cultivated area, the plow layer is dark grayish-brown silt loam about 9 inches thick. The subsoil extends to a depth of 46 inches. It is a grayish-brown and gray, friable and firm silty clay loam mottled with light olive brown, yellowish brown, light brownish gray, and reddish brown to a depth of 18 inches and grayish-brown and gray, firm and brittle silty clay loam mottled with brownish yellow in the lower part. The substratum to a depth of 50 inches is gray shaly silt loam.

Brinkerton soils are slowly permeable and moderate in available moisture capacity. A high water table is at or near the surface during most of the year. The high water table and slow permeability are the main limitations. Much of the acreage has been cleared and is used for pasture and hay, and some areas are wooded.

Representative profile of Brinkerton silt loam, 0 to 3 percent slopes, in a pasture 3½ miles southwest of Upper Strasburg on the Letterkenny Army Depot:

Ap—0 to 9 inches, dark grayish-brown (2.5Y 4/2) silt loam; moderate, medium, granular structure; friable, slightly sticky and slightly plastic; medium acid; clear, wavy boundary.

B21tg—9 to 13 inches, grayish-brown (2.5YR 5/2) silty clay loam; many, fine, faint, light olive-brown (2.5Y 5/6) and yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; medium acid; clear, smooth boundary.

B22tg—13 to 18 inches, gray (10YR 6/1) silty clay loam; few, fine, distinct, light brownish-gray (2.5Y 6/2) and reddish-brown (5YR 4/3) mottles; moderate, me-

dium, subangular blocky structure; firm, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; medium acid; clear, wavy boundary.

Bx1g—18 to 36 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, fine, distinct, brownish-yellow (10YR 6/6) mottles; weak, very coarse, prismatic structure parting to strong, medium, blocky; firm and brittle, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; 5 percent coarse fragments; medium acid; clear, wavy boundary.

Bx2g—36 to 46 inches, gray (5Y 5/1) silty clay loam; common, fine, distinct, brownish-yellow (10YR 6/8) mottles; weak, very coarse, prismatic structure parting to strong, medium, blocky; firm and brittle, slightly sticky and slightly plastic; many, thick, continuous clay films on ped faces; 10 percent coarse fragments; medium acid; clear, wavy boundary.

Cg—46 to 50 inches, gray (10YR 5/1) shaly silt loam; common, fine, distinct, olive-yellow (2.5Y 6/8) mottles; massive; firm, slightly sticky and slightly plastic; 40 percent coarse fragments; medium acid; clear, smooth boundary.

The solum ranges from 40 to 50 inches in thickness, and bedrock is at a depth of 4 to 8 feet or more. The Ap horizon ranges from dark grayish brown to brown. The B21tg and B22tg horizons range from silt loam to silty clay loam and are 0 to 10 percent coarse fragments. The C horizon ranges from loam to silt loam and is 10 to 40 percent coarse fragments.

Brinkerton soils are associated on the landscape with the deep, moderately well drained to somewhat poorly drained Buchanan soils; the deep, well drained Bedington soils; the moderately deep, somewhat poorly drained to moderately well drained Blairton soils; the shallow, well drained Weikert soils; and the moderately deep, well drained Berks soils. They are wetter than those soils.

Brinkerton silt loam, 0 to 3 percent slopes (BrA).—This soil has the profile described as representative of the series. Runoff is slow.

Included with this soil in mapping were a few areas that are very poorly drained and have a darker surface layer and a few areas of moderately well drained soils.

This soil is better suited to pasture, hay, trees, wildlife habitat, and crops tolerant of wetness than to other uses. Artificial drainage increases suitability for crops. The high water table and slow permeability are limitations for most uses. Capability unit IVw-1.

Brinkerton silt loam, 3 to 8 percent slopes (BrB).—This soil has a profile similar to the one described as representative of the series, but the surface layer is about 2 inches thinner. Runoff is medium to rapid.

Included with this soil in mapping were a few areas of somewhat poorly drained soils and a few areas where shale bedrock is at a depth of 20 to 40 inches.

This soil is better suited to crops tolerant of wetness, hay, pasture, trees, and wildlife habitat than to other uses. Artificial drainage increases suitability for crops. Slow permeability and the high water table are limitations for most uses. Capability unit IVw-1.

Buchanan Series

The Buchanan series consists of deep, nearly level to moderately steep, moderately well drained to somewhat poorly drained, medium-textured soils. These soils are on concave middle and lower foot slopes in uplands. They formed in colluvial material derived from acid sandstone and shale.

In a representative profile in a wooded area, the surface layer is very dark gray and light yellowish-brown gravelly loam, about 9 inches thick, that has a 2-inch covering of partly decomposed leaves, twigs, and roots and fresh leaves. The subsoil extends to a depth of 43 inches. It is light yellowish-brown and yellowish-brown, friable and firm gravelly loam and gravelly sandy clay loam mottled with grayish brown to a depth of 20 inches and strong-brown and yellowish-brown, firm and brittle gravelly clay loam mottled with light gray and yellow in the lower part. The substratum to a depth of 50 inches is yellowish-brown sandy clay loam.

Buchanan soils are slowly permeable and moderate in available moisture capacity. A seasonal high water table rises to within ½ foot to 3 feet of the surface during wet periods. The slow permeability, seasonal high water table, coarse fragments, stoniness, and slope are the main limitations. Some of the acreage has been cleared and is used for crops, hay, and pasture. Most stony areas are wooded.

Representative profile of Buchanan extremely stony loam, 0 to 8 percent slopes, in a wooded area 3½ miles southwest of Upper Strasburg on the Letterkenny Army Depot:

O1—2 inches to 1 inch, leaf litter from mixed hardwoods.

O2—1 inch to 0, partly decomposed roots, twigs, and leaves.

A1—0 to 1 inch, very dark gray (10YR 3/1) gravelly loam; weak, fine, granular structure; friable, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; abrupt, smooth boundary.

A2—1 to 9 inches, light yellowish-brown (2.5Y 6/4) gravelly loam; weak, fine, granular structure; friable, slightly sticky and nonplastic; 20 percent coarse fragments; very strongly acid; clear, smooth boundary.

B1—9 to 13 inches, light yellowish-brown (10YR 6/4) gravelly loam; weak, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; 20 percent coarse fragments; very strongly acid; clear, smooth boundary.

B2t—13 to 20 inches, yellowish-brown (10YR 5/6) gravelly sandy clay loam; few, fine, faint, grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; firm, sticky and slightly plastic; few, thin, discontinuous clay films on ped faces; 20 percent coarse fragments; very strongly acid; clear, smooth boundary.

Bx1—20 to 25 inches, strong-brown (7.5YR 5/6) gravelly clay loam; common, coarse, prominent, light-gray (2.5Y 7/2) and yellow (2.5Y 7/8) mottles; weak, very coarse, prismatic structure parting to weak, thick, platy; firm and brittle, sticky and slightly plastic; few, thin, patchy clay films on ped faces; 20 percent coarse fragments; very strongly acid; gradual, wavy boundary.

Bx2—25 to 43 inches, yellowish-brown (10YR 5/6) gravelly clay loam; common, coarse, prominent, light-gray (2.5Y 7/2) and yellow (2.5Y 7/8) mottles; weak, very coarse, prismatic structure parting to weak, thick, platy; firm and brittle, sticky and slightly plastic; few, thick, patchy clay films on ped faces; 20 percent coarse fragments; very strongly acid; gradual, wavy boundary.

C—43 to 50 inches, yellowish-brown (10YR 5/6) sandy clay loam; common, coarse, prominent, pale-yellow (5Y 7/3) and yellowish-red (5YR 5/8) mottles; weak, coarse, blocky structure; firm, slightly sticky and slightly plastic; 15 percent coarse fragments; very strongly acid.

The solum ranges from 40 to 58 inches in thickness, and bedrock is at a depth of 5 to 20 feet or more. The A horizon

ranges from 6 to 10 inches in thickness and from very dark grayish brown to brown in color. The Bx horizon is at a depth of 20 to 36 inches. The B1, B2t, Bx1, and Bx2 horizons range from pale brown to strong brown in color and have mottles that range from dark gray to yellowish red. They are sandy clay loam, silt loam, loam, or clay loam. The B and C horizons range from extremely acid to strongly acid. The C horizon ranges from loam to sandy clay loam. Coarse fragments make up 15 to 30 percent of the profile.

Buchanan soils are associated on the landscape with the deep, well-drained Laidig soils and the deep, poorly drained Andover soils. They are near the deep, well-drained Bedington soils; the moderately deep, well-drained Berks soils; and the shallow, well-drained Weikert soils. Buchanan soils are not so well drained as the Laidig, Bedington, Berks, and Weikert soils and are better drained than the Andover soils.

Buchanan gravelly loam, 2 to 8 percent slopes (BuB).—This soil has a profile similar to the one described as representative of the series, but the surface layer has been plowed and is about 9 inches thick. Runoff is medium.

Included with this soil in mapping were a few areas of well-drained soils, a few areas where the surface layer is gravelly silt loam and silt loam, and a few areas where cobblestones are throughout the profile. Also included were a few areas where the subsoil is slightly acid and a few areas of poorly drained soils.

This soil is suited to crops tolerant of some wetness and to trees and wildlife habitat. The seasonal high water table, coarse fragments, and slow permeability are limitations for most uses. Capability unit IIe-5.

Buchanan gravelly loam, 8 to 15 percent slopes (BuC). This soil has a profile similar to the one described as representative of the series, but the surface layer has been plowed and is about 6 inches thick. Runoff is medium.

Included with this soil in mapping were a few areas of well-drained soils and a few areas where the surface layer is cobbly.

This soil is suited to crops tolerant of some wetness and to trees and wildlife habitat. The seasonal high water table, coarse fragments, slow permeability, and slope are limitations for most uses. Capability unit IIIe-4.

Buchanan extremely stony loam, 0 to 8 percent slopes (BxB).—This soil has the profile described as representative of the series. The surface is 3 to 15 percent stones 10 to 20 inches in size. Runoff is medium.

Included with this soil in mapping were a few areas where the subsoil is reddish brown and a few areas of poorly drained soils. Also included, in the area of South Mountain, were some soils that do not have a fragipan and that contain more sand throughout.

This soil has too many stones for cultivation. It is suited to limited pasture and is well suited to trees and wildlife habitat. The seasonal high water table, stoniness, and slow permeability are limitations for most uses. Capability unit VIIs-2.

Buchanan extremely stony loam, 8 to 25 percent slopes (BxD).—This soil has a profile similar to the one described as representative of the series, but the surface layer is about 2 inches thinner. The surface is 3 to 15 percent stones 10 to 24 inches in size. Runoff is medium.

Included with this soil in mapping were a few areas of well-drained soils, a few areas where the subsoil is reddish brown, and a few areas where the surface layer is more than 15 percent stones.

This soil has too many stones for cultivation. It is suited to pasture and is well suited to trees and wildlife habitat. The seasonal high water table, stoniness, slope, and slow permeability are limitations for most uses. Capability unit VIIs-2.

Clarksburg Series

The Clarksburg series consists of deep, nearly level, moderately well drained, medium-textured soils in concave areas of uplands. These soils formed in colluvial or residual material derived from limestone, calcareous and noncalcareous shale, and sandstone.

In a representative profile in a cultivated area, the plow layer is dark yellowish-brown silt loam about 10 inches thick. The subsoil extends to a depth of 48 inches. The upper 22 inches is yellowish-brown, friable and firm silty clay loam mottled in the lower part with dark grayish brown; the lower part is yellowish-brown, extremely firm and brittle silty clay loam mottled with dark brown and grayish brown. The substratum to a depth of 60 inches is yellowish-brown silty clay loam.

Clarksburg soils are slowly permeable and moderate in available moisture capacity. A seasonal high water table rises to within 1½ to 3 feet of the surface during wet periods. Some areas are subject to accumulation of surface water. Slow permeability and the seasonal high water table are the main limitations. Most of the acreage has been cleared and is used for crops.

Representative profile of Clarksburg silt loam in a cultivated field one-half mile south of Lemasters:

Ap—0 to 10 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; very friable, slightly sticky and slightly plastic; slightly acid; abrupt, smooth boundary.

B1—10 to 18 inches, yellowish-brown (10YR 5/6) silty clay loam; weak, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; slightly acid; gradual, wavy boundary.

B21t—18 to 24 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; slightly acid; gradual, wavy boundary.

B22t—24 to 32 inches, yellowish-brown (10YR 5/6) silty clay loam; few, fine, faint, dark grayish-brown (10YR 4/2) mottles at a depth of 28 inches; moderate, medium, subangular blocky structure; firm, sticky and plastic; few, thick, continuous clay films on ped faces; slightly acid; gradual, wavy boundary.

Bx—32 to 48 inches, yellowish-brown (10YR 5/8) silty clay loam; few, fine, distinct, dark-brown (10YR 4/3) mottles and grayish-brown (10YR 5/2) prism faces; strong, coarse, prismatic structure parting to strong, medium, subangular blocky; extremely firm and brittle, sticky and plastic; few, thin, patchy clay films on blocky ped faces; 5 percent coarse fragments; slightly acid; gradual, wavy boundary.

C—48 to 60 inches, yellowish-brown (10YR 5/8) silty clay loam; few, fine, faint, dark yellowish-brown (10YR 4/4) mottles; weak, very coarse, prismatic structure; extremely firm, sticky and plastic; few black coatings on ped faces; 5 percent coarse fragments; slightly acid.

The solum ranges from 40 to 70 inches in thickness, and bedrock is at a depth of 5 to 15 feet. Depth to the fragipan

ranges from 20 to 36 inches. The Ap horizon ranges from dark yellowish brown to very dark grayish brown. The B1, B21t, and B22t horizons range from strong brown to yellowish brown and are 0 to 20 percent coarse fragments. The B and C horizons range from strongly acid to slightly acid.

Clarksburg soils are associated on the landscape with the deep, well-drained Hagerstown, Duffield, and Nolin soils and the deep, somewhat poorly drained Penlaw soils. They are not so well drained as the Hagerstown, Duffield, and Nolin soils and are better drained than the Penlaw soils.

Clarksburg silt loam (Ck).—This soil is nearly level. Runoff is medium.

Included with this soil in mapping were a few areas where the surface layer is gravelly or cherty. Also included were a few areas of gently sloping Clarksburg soils.

This soil is suited to crops tolerant of some wetness and to hay, pasture, trees, and wildlife habitat. Artificial drainage increases the suitability of the soil for crops. The seasonal high water table and slow permeability are limitations for most uses. Capability unit IIw-2.

Dekalb Series

The Dekalb series consists of moderately deep, nearly level to very steep, well-drained, moderately coarse textured soils on the tops and sides of mountains. These soils formed in material weathered from acid sandstone and some shale.

In a representative profile in a wooded area, the surface layer is very dark gray cobbly sandy loam, about 2 inches thick, that has a 3-inch covering of leaves and partly decomposed roots and leaves. The subsurface layer is yellowish-brown cobbly sandy loam about 6 inches thick. The subsoil is yellowish-brown cobbly sandy loam about 20 inches thick. The substratum extends to a depth of 35 inches and is yellowish-brown very cobbly sandy loam. Sandstone bedrock is at a depth of about 35 inches.

Dekalb soils are rapidly permeable and low in available moisture capacity. Depth to bedrock, stoniness, and slope are the main limitations. Most of the acreage is wooded.

Representatives profile of Dekalb cobbly sandy loam in a wooded area of Dekalb and Hazleton extremely stony sandy loams, 0 to 8 percent slopes, one-fourth mile east of Snowy Mountain Tower on South Mountain:

O1—3 to 2 inches, litter of leaves.

O2—2 inches to 0, partly decomposed mat of roots and leaves.

A1—0 to 2 inches, very dark gray (10YR 3/1) cobbly sandy loam; weak, fine, granular structure; loose, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; clear, smooth boundary.

A2—2 to 8 inches, yellowish-brown (10YR 5/4) cobbly sandy loam; weak, fine, granular structure; loose, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; clear, smooth boundary.

B21t—8 to 17 inches, yellowish-brown (10YR 5/4) cobbly sandy loam; weak, fine, subangular blocky structure; loose, nonsticky and nonplastic; few, thin, silt and clay films and bridges between sand grains; 35 percent coarse fragments; very strongly acid; clear, smooth boundary.

B22t—17 to 28 inches, yellowish-brown (10YR 5/4) cobbly sandy loam; weak, fine, subangular blocky structure; loose, nonsticky and nonplastic; few clay bridges between sand grains; 35 percent coarse fragments; strongly acid; clear, wavy boundary.

C—28 to 35 inches, yellowish-brown (10YR 5/4) very cobbly sandy loam; single grained; loose, nonsticky and nonplastic; 90 percent coarse fragments; strongly acid; clear, wavy boundary.

R—35 inches, sandstone bedrock.

The solum ranges from 20 to 34 inches in thickness, and bedrock is at a depth of 1½ to 3½ feet. The B21 and B22 horizons range from yellowish brown to reddish yellow. The C horizon ranges from very channery sandy loam to very cobbly loamy sand.

Dekalb soils are associated on the landscape with the deep, well-drained Hazleton soils; the moderately deep, well-drained to excessively drained Leetonia and Lehew soils; and the deep, well-drained Vanderlip soils. Dekalb soils have a thinner A2 horizon and a less sandy B horizon than the Leetonia soils; they do not have the reddish-colored B horizon that is characteristic of the Lehew soils; and they are not so deep over rock as the Hazleton and Vanderlip soils.

Dekalb and Hazleton extremely stony sandy loams, 0 to 8 percent slopes (DeB).—Some areas of this mapping unit are Dekalb soils, some are Hazleton soils, and some areas contain both. These soils have the profiles described as representative of the Dekalb and Hazleton series. The surface layer is 3 to 15 percent stones 10 to 20 inches in size. Surface runoff is medium.

Included with these soils in mapping were a few small areas of reddish soils, a few areas where the surface layer is channery loam, and a few areas where the surface layer is more than 15 percent stones.

These soils are better suited to trees and wildlife habitat than to crops. Stoniness and depth to bedrock are limitations for most uses. Capability unit VIIs-1.

Dekalb and Hazleton extremely stony sandy loams, 8 to 25 percent slopes (DeD).—Some areas of this mapping unit are Dekalb soils, some are Hazleton soils, and some areas contain both. The Dekalb soil has a profile similar to the one described as representative of the series, but is a few inches shallower over bedrock. The Hazleton soil has a profile similar to the one described as representative of the series, but the surface layer is 4 inches thick. The surface layer is 3 to 15 percent stones 10 to 25 inches in size. Surface runoff is rapid.

Included with these soils in mapping were a few areas where the surface layer is more than 15 percent stones and a few areas where the surface layer is channery loam.

These soils are better suited to trees and wildlife habitat than to crops. Depth to bedrock, stoniness, and slope are limitations for most uses. Capability unit VIIs-1.

Dekalb and Lehew extremely stony soils, 25 to 75 percent slopes (DlF).—Some areas of this mapping unit are entirely Dekalb soils, some are Lehew soils, and some areas contain both. The Lehew soil has the profile described as representative of the Lehew series. The Dekalb soil has a profile similar to the one described as representative of the Dekalb series, but it is not so deep over bedrock. The surface layer is 3 to 15 percent stones 10 to 40 inches in size. It ranges from channery loam to flaggy sandy loam in texture. Runoff is rapid.

Included with these soils in mapping were some areas where more than 15 percent of the surface layer is stones.

These soils are better suited to trees and wildlife habitat than to other uses. Slope, depth to bedrock, and stoniness are limitations for most uses. Capability unit VIIs-3.

Duffield Series

The Duffield series consists of deep, nearly level to sloping, well-drained, medium-textured soils on uplands (fig. 20). These soils formed in material weathered from impure limestone.

In a representative profile in a cultivated area, the plow layer is silt loam about 10 inches thick. The subsoil is yellowish-brown and brownish-yellow, friable and firm silt loam, loam, channery loam, and silty clay loam and extends to a depth of 56 inches. The substratum to a depth of 95 inches is olive-yellow clay streaked with brown.

Duffield soils are moderately permeable and high in available moisture capacity. These soils have few limitations for most uses. Nearly all the acreage has been cleared and is used for crops, hay, pasture, and fruit trees.

Representative profile of Duffield silt loam, 3 to 8 percent slopes, in a cultivated field 1¼ miles northeast of Duffield along Route T499 [profile S65-Pa-28-12 (1-6) in tables 12 and 13]:

Ap—0 to 10 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable, slightly sticky and slightly plastic; less than 5 percent coarse fragments; mildly alkaline; abrupt, smooth boundary.

B21t—10 to 20 inches, yellowish-brown (10YR 5/4) silt loam that has dark yellowish-brown (10YR 4/4) ped coatings; weak, fine, subangular blocky structure; friable, slightly sticky and plastic; few, thin, patchy clay films on ped faces; 10 percent coarse fragments; slightly acid; gradual, wavy boundary.

B22t—20 to 29 inches, yellowish-brown (10YR 5/6) loam that has brown (10YR 4/3) ped coatings; weak, coarse, prismatic structure parting to moderate, fine, angular and subangular blocky; friable to firm, sticky and plastic; common, thick, patchy clay films on ped faces; few black coatings; 10 percent coarse fragments; slightly acid; clear, wavy boundary.

B23t—29 to 40 inches, yellowish-brown (10YR 5/8) and brownish-yellow (10YR 6/8) channery loam that has brown (10YR 5/3) ped coatings; weak, coarse, prismatic structure parting to moderate, medium, angular and subangular blocky; firm, slightly sticky and slightly plastic; many, thick, continuous clay films on ped faces; few black coatings; 20 percent coarse fragments; slightly acid; clear, wavy boundary.

B24t—40 to 56 inches, brownish-yellow (10YR 6/6) silty clay loam that has pockets and coatings of brown (10YR 5/3); weak, coarse, prismatic structure parting to

Figure 20.—Typical landscape of Duffield silt loam on uplands.

moderate, medium, subangular blocky; firm, slightly sticky and slightly plastic; many, thick, continuous clay films on ped faces; 5 percent coarse fragments; slightly acid; gradual, wavy boundary.

C—56 to 95 inches, olive-yellow (2.5Y 6/6) clay streaked with brown (10YR 5/3); moderate, thin and medium, platy structure inherited from bedding planes; friable, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; less than 5 percent coarse fragments; medium acid.

The solum ranges from 40 to 70 inches in thickness, and bedrock is at a depth of 6 to 10 feet. The Ap horizon ranges from dark grayish brown to dark brown. The B horizon ranges from yellowish brown to reddish yellow and from silt loam or loam to silty clay.

Duffield soils are associated on the landscape with the moderately deep, well drained Ryder soils; the deep, well drained Murrill and Hagerstown soils; and the deep, moderately well drained Clarksburg soils. Duffield soils have a more silty Bt horizon than the Murrill soils and a less clayey Bt horizon than the Hagerstown soils; they are deeper than the Ryder soils; and they are better drained than the Clarksburg soils.

Duffield silt loam, 0 to 3 percent slopes (DsA).—This soil has a profile similar to the one described as representative of the series, but the surface layer is dark grayish brown. Runoff is medium. Included in mapping were a few small areas of Clarksburg soils.

This soil is suited to the crops commonly grown in the county and to trees and wildlife habitat. It has few limitations. Capability unit I-2.

Duffield silt loam, 3 to 8 percent slopes (DsB).—This soil has the profile described as representative of the series. Runoff is medium.

Included with this soil in mapping were a few small areas of Clarksburg soils and some areas where the surface layer is lighter colored. Also included were a few areas of Ryder soils.

This Duffield soil is suited to the crops commonly grown in the county and to trees and wildlife habitat. The hazard of erosion and slope are limitations for some uses. Capability unit IIe-1.

Duffield silt loam, 8 to 15 percent slopes (DsC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is about 2 inches thinner. Runoff is medium.

Included with this soil in mapping were a few areas where the surface layer is shaly and a few areas of Ryder soils. Also included were a few areas that have limestone outcrops.

This Duffield soil is suited to the crops commonly grown in the county and to trees and wildlife habitat. Slope and the hazard of erosion are limitations for some uses. Capability unit IIIe-1.

Duffield silt loam, 8 to 15 percent slopes, eroded (DsC3).—This soil has a profile similar to the one described as representative of the series, but the surface layer is lighter colored and about 4 inches thinner. Most of the original surface layer has been lost through erosion, and plowing exposes the subsoil. Runoff is medium. Included in mapping were a few areas of Ryder soils.

This soil is suited to most of the crops commonly grown in the county and to trees and wildlife habitat. Slope and the hazard of erosion are limitations for most uses. Capability unit IVe-1.

Dunning Series

The Dunning series consists of deep, nearly level, very poorly drained to poorly drained, moderately fine textured soils on flood plains. These soils formed in stream deposits washed from uplands underlain by calcareous material.

In a representative profile in a cultivated area, the plow layer is black silty clay loam about 10 inches thick. The next 6 inches is very dark gray, friable heavy silty clay loam mottled with brown. The subsoil extends to a depth of 48 inches. It is dark-gray, firm silty clay mottled with light olive brown to a depth of 21 inches and yellowish-brown, friable heavy silty clay loam and loam mottled with light gray and light brownish gray in the lower part. The substratum to a depth of 70 inches is yellowish-brown sandy clay loam.

Dunning soils are slowly permeable and high in available moisture capacity. A high water table is at the surface much of the year. Flooding, the high water table, and the slow permeability are the main limitations. Most of the acreage has been cleared and is used for hay and pasture. A few areas are idle or wooded.

Representative profile of Dunning silty clay loam in a cultivated field 2 miles northeast of Green Village, near the intersection of U.S. Routes 11 and L28015:

Ap—0 to 10 inches, black (10YR 2/1) silty clay loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; slightly acid; clear, wavy boundary.

A2g—10 to 16 inches, very dark gray (10YR 3/1) heavy silty clay loam; few, medium, faint, brown (10YR 5/3) mottles; strong; medium, subangular blocky structure; friable, sticky and plastic; neutral; gradual, smooth boundary.

B1g—16 to 21 inches, dark-gray (10YR 4/1) silty clay; many, fine, distinct, light olive-brown (2.5Y 5/4) mottles; strong, medium, blocky structure; firm, sticky and plastic; few, thin, patchy clay films on ped faces; scattered pockets of sand and fine gravel; neutral; gradual, smooth boundary.

B21—21 to 40 inches, yellowish-brown (10YR 5/8) heavy silty clay loam; few, medium, distinct, light-gray (10YR 7/2) and light brownish-gray (10YR 6/2) mottles; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; scattered lenses of fine gravel; neutral; gradual, smooth boundary.

B22—40 to 48 inches, yellowish-brown (10YR 5/8) loam; few, fine, faint, light-gray (10YR 7/2) mottles; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; 10 percent coarse fragments; neutral; gradual, irregular boundary.

C—48 to 70 inches, yellowish-brown (10YR 5/6) sandy clay loam; weak, fine, subangular blocky structure; very friable, slightly sticky and slightly plastic; 10 percent coarse fragments; neutral.

The solum ranges from 35 to 50 inches in thickness, and bedrock is at a depth of 6 to 10 feet. The Ap horizon ranges from black to very dark grayish brown. The B1g horizon ranges from gray to dark gray and from sandy clay to heavy silty clay. The B21 and B22 horizons range from yellowish brown to very dark brown. The soil ranges from medium acid to mildly alkaline throughout.

In the Dunning soils in Franklin County chroma in the B2 and C horizons is higher than is defined for the series. This

difference does not alter the usefulness and behavior of the soils.

Dunning soils are associated on the landscape with the deep, somewhat poorly drained to moderately well drained Dunning overwash variant and the deep, poorly drained Melvin soils on flood plains. The deep, somewhat poorly drained Penlaw soils and the moderately well drained Clarksburg soils are on nearby uplands. Dunning soils are wetter than those soils.

Dunning silty clay loam (Du).—This soil is nearly level. Runoff is slow to very slow. Included in mapping were a few small areas where the surface layer is sandy clay loam and gravelly.

This soil is better suited to hay, pasture, trees, and wildlife habitat than to other uses. Artificial drainage increases suitability for crops. The hazard of flooding, slow permeability, and the high water table are limitations for most uses. Capability unit IVw-2.

Dunning Series, Overwash Variant

The Dunning series, overwash variant, consists of deep, nearly level, moderately well drained to somewhat poorly drained, medium-textured soils on flood plains. These soils formed in stream deposits washed from uplands underlain by calcareous bedrock.

In a representative profile in a cultivated area, the plow layer is dark grayish-brown silt loam about 10 inches thick. The subsoil extends to a depth of about 26 inches. It is yellowish-brown and dark grayish-brown, friable silt loam that has grayish-brown and brown coatings and streaks. The next 6 inches is a buried older surface layer that is black, firm gravelly clay loam. The next 14 inches is dark-gray, firm gravelly clay loam mottled with yellowish brown. The substratum to a depth of 56 inches is dark-gray, firm, gravelly sandy clay loam. Stratified gravel is between depths of 56 and 60 inches.

Dunning overwash variant soils are moderately permeable and moderate in available moisture capacity. A seasonal high water table is within ½ foot to 3 feet of the surface during wet periods. Flooding and the seasonal high water table are the main limitations. These soils are used for crops and pasture.

Representative profile of Dunning silt loam, overwash variant, in a pasture about 1½ miles north of Waynesboro [profile S65-Pa-28-10(1-6) in tables 12 and 13]:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable, slightly sticky and slightly plastic; moderately alkaline; abrupt, smooth boundary.

B21—10 to 21 inches, yellowish-brown (10YR 5/4) silt loam that has few, fine, faint, grayish-brown (10YR 5/2) coatings; weak, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; moderately alkaline; clear, wavy boundary.

B22g—21 to 26 inches, dark grayish-brown (10YR 4/2) silt loam that has few, fine, faint, brown (10YR 5/3) streaks; weak, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; mildly alkaline; clear, wavy boundary.

IIA1b—26 to 32 inches, black (10YR 2/1) gravelly clay loam; moderate, coarse, blocky structure; firm, sticky and plastic; common, patchy, silt and clay films on ped faces; 30 percent coarse fragments; mildly alkaline; gradual, wavy boundary.

IIB2bg—32 to 46 inches, dark-gray (N 4/0) gravelly clay loam; many, medium, distinct, yellowish-brown (10YR 5/4) mottles; weak, coarse, prismatic structure parting to weak, fine, blocky; firm, sticky and plastic; common, patchy, silt and clay films on ped faces; 30 percent coarse fragments; mildly alkaline; clear, wavy boundary.

IIICg—46 to 56 inches, dark-gray (N 4/0) gravelly sandy clay loam; massive; firm, sticky and plastic; 30 percent coarse fragments; neutral; clear, smooth boundary.

IVC—56 inches to 60 inches, stratified gravel.

The Ap horizon ranges from dark brown to dark grayish brown. The B21 and B22g horizons range from yellowish brown to very dark grayish brown. The buried IIA1b horizon is at a depth of 20 to 30 inches. It ranges from black to very dark brown and from silt loam to silty clay loam. The C horizon ranges from silty clay loam to gravelly sandy loam. It grades with increasing depth to stratified sand and gravel.

The Dunning overwash variant is associated on the landscape with the poorly drained Melvin soils and the poorly drained to very poorly drained Dunning soils. It is better drained than those soils.

Dunning silt loam, overwash variant (Dv).—This soil is nearly level. Included in mapping were a few small areas of poorly drained Melvin soils and well-drained Pope soils.

This Dunning overwash variant soil is suited to all but deep-rooted crops. It is also suited to pasture, trees, and wildlife habitat. Artificial drainage increases suitability for crops. The hazard of flooding and the seasonal high water table are limitations for most uses. Capability unit IIw-1.

Edgemont Series

The Edgemont series consists of deep, gently sloping to moderately steep, well-drained, medium-textured soils on hills and ridges. These soils formed in material weathered from quartzite and conglomerate.

In a representative profile in a wooded area, the surface layer is black and yellowish-brown channery loam, about 10 inches thick, that has a 2-inch covering of leaves and decomposed leaves and roots. The subsoil extends to a depth of 33 inches. It is yellowish-brown, friable channery loam to a depth of 15 inches and light yellowish-brown and yellowish-brown, friable channery heavy loam in the lower part. The substratum to a depth of 48 inches is light yellowish-brown very channery loam.

Edgemont soils are moderately permeable to moderately rapidly permeable and moderate in available moisture capacity. Coarse fragments, slope, and stoniness are the main limitations. Most of the acreage is wooded. A few areas have been cleared and are used for hay, pasture, crops, and fruit trees.

Representative profile of Edgemont channery loam, 3 to 8 percent slopes, in a woodlot 1¼ miles southeast of Quincy:

O1—2 inches to 1 inch, leaf litter, mostly oak.

O2—1 inch to 0, very dark gray (10YR 3/1), decomposed mat of leaves and roots.

A1—0 to 2 inches, black (10YR 2/1) channery loam; weak, fine, granular structure; very friable, nonsticky and nonplastic; 35 percent coarse fragments; very strongly acid; abrupt, smooth boundary.

A2—2 to 10 inches, yellowish-brown (10YR 5/8) channery loam; weak, fine, granular structure; friable, non-

sticky and nonplastic; 35 percent coarse fragments; very strongly acid; clear, smooth boundary.

B1—10 to 15 inches, yellowish-brown (10YR 5/6) channery loam; weak, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; 40 percent coarse fragments; very strongly acid; clear, wavy boundary.

B21t—15 to 27 inches, light yellowish-brown (10YR 6/4) channery heavy loam; weak, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; 40 percent coarse fragments; very strongly acid; clear, wavy boundary.

B22t—27 to 33 inches, yellowish-brown (10YR 5/6) channery heavy loam; weak, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; 45 percent coarse fragments; very strongly acid; clear, wavy boundary.

C—33 to 48 inches, light yellowish-brown (10YR 6/4) very channery loam; massive; very friable, slightly sticky and slightly plastic; 80 percent coarse fragments; very strongly acid.

The solum ranges from 25 to 40 inches in thickness, and bedrock is at a depth of 3½ to 6 feet. The A horizon ranges from dark grayish brown to very dark grayish brown. The B1, B21t, and B22t horizons range from sandy loam to clay loam. The B and C horizons range from strongly acid to extremely acid. The C horizon ranges from light yellowish brown to brown and is 20 to 90 percent coarse fragments.

The Edgemont soils in Franklin County have a Bt horizon that is 35 to 45 percent coarse fragments, which is outside the range defined for the series. This difference does not alter the usefulness and behavior of the soils.

Edgemont soils are associated on the landscape with the moderately deep, well-drained Dekalb soils and the deep, well-drained Hazleton, Murrill, and Vanderlip soils. They have a thinner Bt horizon than the Murrill soils; and they have a Bt horizon, which does not occur in the Hazleton and Vanderlip soils.

Edgemont channery loam, 3 to 8 percent slopes (EcB).—This soil has the profile described as representative of the series. Runoff is medium. Included in mapping were a few areas where the surface layer is channery sandy loam.

This soil is suited to most of the crops commonly grown in the county and to trees and wildlife habitat. Coarse fragments and slope are limitations for some uses. Capability unit IIe-4.

Edgemont channery loam, 8 to 20 percent slopes (EcC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is about 2 inches thinner. Runoff is medium to rapid. Included in mapping were a few areas where the surface layer is cobbly sandy loam.

This soil is suited to trees, wildlife habitat, and most crops commonly grown in the county. Coarse fragments and slope are limitations for some uses. Capability unit IIIe-4.

Edgemont extremely stony loam, 5 to 20 percent slopes (EdC).—This soil has a profile similar to the one described as representative of the series, but its surface layer is 3 to 15 percent stones 10 to 25 inches in size. Runoff is medium to rapid. Included in mapping were a few areas where the surface layer is more than 15 percent stones.

This soil is suited to trees and wildlife habitat. Stoniness, coarse fragments, and slope are limitations for most uses. Capability unit VIIs-1.

Edom Series

The Edom series consists of deep, nearly level to sloping, well-drained, moderately fine textured soils on dissected uplands. These soils formed in material weathered from shaly limestone and calcareous shale.

In a representative profile in a cultivated area, the plow layer is very dark grayish-brown and dark-brown silty clay loam about 8 inches thick. The subsoil extends to a depth of 33 inches. It is dark-brown, friable silty clay loam to a depth of 13 inches and yellowish-brown, firm silty clay in the lower part. The substratum extends to a depth of 42 inches and is dark-gray very channery clay. Shaly limestone is at a depth of about 42 inches.

Edom soils are moderately permeable and moderate in available moisture capacity. The erosion hazard, sinkholes, and slope are the main limitations. Most of the acreage has been cleared and is used for crops, hay, and pasture. A few areas are idle or wooded, and a few are used for fruit trees.

Representative profile of Edom silty clay loam, 2 to 8 percent slopes, in a pasture one-fourth mile southeast of Springtown:

Ap1—0 to 2 inches, very dark grayish-brown (10 YR 3/2) silty clay loam; moderate, fine, granular structure; friable, slightly sticky and slightly plastic; 5 percent coarse fragments; neutral; clear, smooth boundary.

Ap2—2 to 8 inches, dark-brown (10YR 4/3) silty clay loam; moderate, medium, blocky structure; friable, slightly sticky and plastic; 5 percent coarse fragments; neutral; clear, wavy boundary.

B21t—8 to 13 inches, dark-brown (10YR 4/3) silty clay loam; moderate, medium, blocky structure; friable, sticky and plastic; few, thin, discontinuous clay films on ped faces; 5 percent coarse fragments; neutral; clear, wavy boundary.

B22t—13 to 23 inches, yellowish-brown (10YR 5/4) silty clay; moderate, medium, blocky structure; firm, sticky and plastic; common, thick, patchy clay films on ped faces; 5 percent coarse fragments; neutral; clear, wavy boundary.

B23t—23 to 33 inches, yellowish-brown (10YR 5/4) silty clay that has dark-brown (10YR 4/3) coatings on ped faces; moderate, medium, blocky structure; firm, very sticky and very plastic; common, thick, patchy clay films on ped faces and in pores; 5 percent coarse fragments; mildly alkaline; abrupt, wavy boundary.

C—33 to 42 inches, dark-gray (10YR 4/1) very channery clay; weak, medium, platy structure; firm, sticky and plastic; 75 percent coarse fragments; mildly alkaline; gradual, wavy boundary.

R—42 inches, shaly limestone bedrock.

The solum ranges from 20 to 35 inches in thickness, and bedrock is at a depth of 3½ to 5 feet or more. The Ap1 and Ap2 horizons range from olive brown to dark brown and are 5 to 15 percent coarse fragments. The B horizon ranges from silty clay loam to clay, and the B21t and B22t horizons are 5 to 30 percent coarse fragments. Free carbonates are in the B horizon in some places. The C horizon is 30 to 75 percent coarse fragments. The soil is slightly acid to mildly alkaline throughout.

Edom soils are associated on the landscape with the deep, well drained Hagerstown and Murrill soils; the moderately deep, well drained Berks soils; the deep Edom moderately well drained variant; and the deep, moderately well drained Clarksburg soils. Edom soils have a thinner Bt horizon than the Hagerstown soils; they contain more clay in the Bt horizon than the Murrill soils; they are deeper than the Berks soils; and they are better drained than the Clarksburg soils.

Edom silty clay loam, 2 to 8 percent slopes (EeB).—This soil has the profile described as representative of the series. Runoff is medium to rapid.

Included with this soil in mapping were a few areas where the subsoil contains less clay and some areas where the surface layer is silty clay.

This soil is suited to most crops commonly grown in the county and to trees and wildlife habitat. It has few limitations for most uses. Capability unit IIe-3.

Edom silty clay loam, 8 to 15 percent slopes (EeC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is about 2 inches thinner. Runoff is rapid.

Included with this soil in mapping were a few areas where the subsoil is less clayey. Also included were a few areas where nearly all of the original surface layer has been lost through erosion.

This soil is suited to most crops commonly grown in the county and to trees and wildlife habitat. Slope, sinkholes, and the hazard of contamination of ground water are limitations for most uses. Capability unit IIIe-3.

Edom Series, Moderately Well Drained Variant

The Edom series, moderately well drained variant, consists of deep, nearly level and gently sloping, moderately fine textured soils on uplands. These soils formed in material weathered from shaly limestone and calcareous shale.

In a representative profile in a cultivated area, the surface layer is dark grayish-brown silty clay loam about 7 inches thick. The subsoil extends to a depth of 30 inches. It is light yellowish-brown, firm silty clay loam to a depth of 13 inches and strong-brown, firm and very firm silty clay loam and silty clay mottled with light yellowish brown, grayish brown, and light gray in the lower part. The substratum extends to a depth of 42 inches and is yellowish-brown shaly silty clay loam. Calcareous shale bedrock is at a depth of about 42 inches.

Edom moderately well drained variant soils are slowly permeable and moderate in available moisture capacity. A seasonal high water table rises to within $1\frac{1}{2}$ to 3 feet of the surface during wet periods. The slow permeability and the seasonal high water table are the main limitations. Nearly all the acreage has been cleared and is used for crops, pasture, or hay. A few areas are idle or wooded.

Representative profile of Edom silty clay loam, moderately well drained variant, 2 to 8 percent slopes, in a hayfield 2 miles southwest of Upper Strasburg on the Letterkenny Army Depot:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silty clay loam; moderate, fine, granular structure; friable, sticky and plastic; slightly acid; abrupt, smooth boundary.

B21t—7 to 13 inches, light yellowish-brown (10YR 6/4) silty clay loam; moderate, medium, subangular blocky structure; firm, sticky and plastic; few, thin, patchy clay films on ped faces; 5 percent coarse fragments; medium acid; gradual, wavy boundary.

B22t—13 to 18 inches, strong-brown (7.5YR 5/6) silty clay loam; common, fine, distinct, light yellowish-brown (10YR 6/4) and grayish-brown (10YR 5/2) mottles; strong, medium, subangular blocky structure; firm, sticky and plastic; 5 percent coarse fragments; thick, continuous clay films on ped faces; medium acid; gradual, wavy boundary.

B23t—18 to 30 inches, strong-brown (7.5YR 5/6) silty clay; common, fine, distinct, light-gray (N 7/0) and light yellowish-brown (10YR 6/4) mottles; strong, coarse, subangular blocky structure; very firm, sticky and plastic; thick, continuous clay films on ped faces; 10 percent coarse fragments; neutral; gradual, wavy boundary.

C—30 to 42 inches, yellowish-brown (10YR 5/6) shaly silty clay loam; many, fine, distinct, light-gray (10YR 7/2), olive-brown (2.5YR 4/4), and dark-gray (10YR4/1) mottles; moderate, medium, subangular blocky structure; friable, slightly sticky and nonplastic; 30 percent coarse fragments; mildly alkaline; abrupt, smooth boundary.

R—42 inches, calcareous shale bedrock.

The solum ranges from 20 to 35 inches in thickness, and bedrock is at a depth of $3\frac{1}{2}$ to 5 feet or more. The A and B horizons range from medium acid to mildly alkaline. The B horizon ranges from silty clay loam to clay.

The Edom moderately well drained variant is associated on the landscape with the deep, well drained Edom and Hagerstown soils; the moderately deep, well drained Berks soils; and the shallow, well drained Weikert soils. It is not so well drained as those soils.

Edom silty clay loam, moderately well drained variant, 2 to 8 percent slopes (EIB).—This soil has medium runoff. Included in mapping were some areas of Blairton and Clarksburg soils.

This Edom soil is suited to crops somewhat tolerant of wetness and to trees and wildlife habitat. The seasonal high water table and slow permeability are limitations for many uses. Capability unit IIe-5.

Glenville Series

The Glenville series consists of deep, gently sloping, somewhat poorly drained to moderately well drained, medium-textured soils. These soils are on upland flats and foot slopes and near the heads of drainageways. They formed in material weathered from acid crystalline rocks that contain mica.

In a representative profile the surface layer is grayish-brown channery silt loam, about 12 inches thick, that has a 3-inch covering of leaves and partly decomposed leaves and roots. The subsoil extends to a depth of 39 inches. It is brown, friable channery silt loam mottled with yellowish brown to a depth of 20 inches and yellowish-brown, firm and brittle channery light silty clay loam mottled with light gray, dark yellowish brown, and strong brown in the lower part. The substratum to a depth of 54 inches is gray channery silt loam.

Glenville soils are moderately slowly permeable and moderate in available moisture capacity. A seasonal high water table rises to within $\frac{1}{2}$ foot to 3 feet of the surface during wet periods. The moderately slow permeability and the seasonal high water table are the main limitations. Much of the acreage has been cleared and is used for pasture or hay, and a few areas are used for crops or are wooded.

Representative profile of Glenville channery silt loam, 3 to 8 percent slopes, in a woodlot $1\frac{1}{2}$ miles northeast of South Mountain Post Office:

O1—3 inches to 1 inch, litter of poplar and hemlock leaves and white pine needles.
O2—1 inch to 0, black (10YR 2/1) mat of partly decomposed leaves and roots.
A1—0 to 12 inches, grayish-brown (10YR 5/2) channery silt loam; moderate, medium, granular structure; friable, slightly sticky and slightly plastic; 20 percent coarse fragments; strongly acid; clear, smooth boundary.
B2t—12 to 20 inches, brown (10YR 5/3) channery silt loam; few, fine, faint, yellowish-brown (10YR 5/4) mottles; moderate, medium, blocky structure; friable, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; 20 percent coarse fragments; strongly acid; clear, smooth boundary.
Bx1—20 to 32 inches, yellowish-brown (10YR 5/4) channery light silty clay loam; many, fine, distinct, light-gray (10YR 7/2) and dark yellowish-brown (10YR 4/4) mottles; moderate, medium, platy structure; firm and brittle, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; 20 percent coarse fragments; strongly acid; gradual, wavy boundary.
Bx2—32 to 39 inches, yellowish-brown (10YR 5/4) channery light silty clay loam; many, fine, distinct, strong-brown (7.5YR 5/8) mottles; moderate, medium, platy structure; firm and brittle, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; 20 percent coarse fragments; strongly acid; gradual, smooth boundary.
C—39 to 54 inches, gray (10YR 5/1) channery silt loam; massive; firm, slightly sticky and slightly plastic; 35 percent coarse fragments; very strongly acid.

The solum ranges from 30 to 48 inches in thickness, and bedrock is at a depth of 4 to 6 feet or more. The Ap horizon ranges from grayish brown to light olive brown. The B2t, Bx1, and Bx2 horizons range from dark brown to brownish yellow and from light silty clay loam to heavy loam.

Glenville soils are associated on the landscape with the deep, well-drained Highfield and Edgemont soils. They are not so well drained as those soils.

Glenville channery silt loam, 3 to 8 percent slopes (GlB).—Runoff is slow to medium on this soil. Included in mapping were a few areas of poorly drained soils that are shown on the map by a wet spot symbol. Also included were a few areas of stony soils that are shown by a stone spot symbol.

This soil is suited to crops somewhat tolerant of wetness and to hay, pasture, trees, and wildlife habitat. Artificial drainage increases suitability for crops. The moderately slow permeability, coarse fragments, and seasonal high water table are limitations for most uses. Capability unit IIe-5.

Hagerstown Series

The Hagerstown series consists of deep, nearly level to steep, well-drained, medium-textured to fine-textured soils on uplands. These soils formed in material weathered from relatively pure limestone.

In a representative profile in a cultivated area, the plow layer is dark reddish-gray silt loam about 10 inches thick. The subsoil extends to a depth of 56 inches. It is reddish-brown, friable to firm silty clay loam to a depth of 21 inches and red and yellowish-red, firm to very firm silty clay in the lower part. The substratum extends to a depth of 73 inches and is yellowish-red, very firm silty clay loam. Limestone bedrock is at a depth of about 73 inches.

Hagerstown soils are moderately permeable and high to moderate in available moisture capacity. The erosion hazard, underground solution caverns, and sinkholes are the main limitations. Most of the acreage has been cleared and is used for crops. A few areas are wooded, and a few are used for fruit trees.

Representative profile of Hagerstown silt loam, 3 to 8 percent slopes, in a cultivated field 2 miles south of Chambersburg:

Ap—0 to 10 inches, dark reddish-gray (5YR 4/2) silt loam; weak, fine, granular structure; very friable, slightly sticky and slightly plastic; neutral; abrupt, smooth boundary.
B1t—10 to 21 inches, reddish-brown (5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; friable to firm, sticky and slightly plastic; few, thin, discontinuous clay films on ped faces; neutral; clear, wavy boundary.
B21t—21 to 43 inches, red (2.5YR 5/6) silty clay; moderate, medium, subangular blocky structure; firm to very firm, sticky and plastic; many, thick, continuous clay films on ped faces; few scattered black coatings on ped faces in lower part; neutral; gradual, irregular boundary.
B22t—43 to 56 inches, red (2.5YR 4/6) and yellowish-red (5YR 4/6) silty clay; moderate, medium, subangular blocky structure; firm to very firm, sticky and plastic; many, thick, continuous clay films on most ped faces; numerous black coatings on ped faces; neutral; gradual, wavy boundary.
C—56 to 73 inches, yellowish-red (5YR 4/8) silty clay loam; weak, coarse, subangular blocky structure; very firm, slightly sticky and plastic; few, thin, patchy clay films on ped faces; many black coatings on ped faces; neutral; a few pockets that effervesce slightly with hydrochloric acid; gradual, irregular boundary.
R—73 inches, limestone bedrock.

The solum ranges from 40 to 60 inches in thickness, and limestone bedrock is at a depth of 3½ to 7 feet or more. The Ap horizon ranges from very dark grayish brown to reddish brown and from silt loam to silty clay in texture. The B21t and B22t horizons range from strong brown to red and from silty clay loam to clay. The C horizon ranges from light red to dark yellowish brown and in many places is variegated.

Hagerstown soils are associated on the landscape with the deep, well drained Edom, Duffield, Nolin, and Murrill soils; the moderately deep, well drained Ryder and Berks soils; the deep, moderately well drained Clarksburg soils; and the deep, somewhat poorly drained Penlaw soils. Hagerstown soils are redder and have a more clayey Bt horizon than the Duffield soils; they have a thicker solum than the Edom soils; and they do not have the coarse fragments that are characteristic of the Murrill soils. They are deeper than the Ryder and Berks soils; they are better drained than the Penlaw and Clarksburg soils; and they are more clayey in the upper part of the B horizon than the Nolin soils.

Hagerstown silt loam, 0 to 3 percent slopes (HeA).—The profile of this soil is similar to the one described as representative of the series, but the surface layer is darker and about 2 inches thicker. Runoff is medium. Included in mapping were small areas of Duffield and Clarksburg soils.

This Hagerstown soil is suited to the crops commonly grown in the county and to trees and wildlife habitat. Sinkholes and the hazard of contamination of ground water are limitations for some uses. Capability unit I-2.

Hagerstown silt loam, 3 to 8 percent slopes (HeB).—This soil has the profile described as representative of the series. Runoff is medium.

Included with this soil in mapping were small areas of Hagerstown soils in which the plow layer is silty clay loam and a few small areas where coarse fragments of chert or quartz occur throughout the profile.

This soil is suited to the crops commonly grown in the county and to trees and wildlife habitat. Sinkholes and the hazard of contamination of ground water are limitations for some uses. Capability unit IIe-1.

Hagerstown silt loam, 8 to 15 percent slopes (HeC).—The profile of this soil is similar to the one described as representative of the series, but the surface layer is about 2 inches thinner. Runoff is medium to rapid.

Included with this soil in mapping were small areas where the surface layer is silty clay loam or silty clay. Also included were a few small areas where limestone outcrops and a few areas where the surface layer is cherty silt loam.

This Hagerstown soil is suited to most crops commonly grown in the county and to woodland and wildlife habitat. Sinkholes, slope, and the hazard of contamination of ground water are limitations for some uses. Capability unit IIIe-1.

Hagerstown silty clay loam, 2 to 8 percent slopes (HfB).—This soil has a profile similar to the one described as representative of the series, but the surface layer differs in texture and is about 2 inches thinner, and the soil is a few inches shallower over bedrock. Runoff is medium.

Included with this soil in mapping were small areas where nearly all of the original surface layer has been lost through erosion, and plowing exposes the subsoil. Also included were a few areas where limestone outcrops.

This soil is suited to most crops commonly grown in the county and to trees and wildlife habitat. Sinkholes, irregular depth to limestone, and the hazard of contamination of ground water are limitations for some uses. Capability unit IIe-3.

Hagerstown rocky silty clay loam, 3 to 8 percent slopes, eroded (HgB3).—This soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam. Most of the original surface layer has been removed by erosion. Limestone outcrops cover 2 to 10 percent of the surface. Runoff is medium to rapid.

Included with this soil in mapping were a few small areas where limestone bedrock is at a depth of 10 to 20 inches. Also included were a few areas where the surface layer is silt loam.

This soil is suited to hay, pasture, and crops that require limited tillage. It is also suited to trees and wildlife habitat. Limestone outcrop, sinkholes, and the hazard of contamination of ground water are limitations for some uses. Capability unit IVs-1.

Hagerstown rocky silty clay loam, 8 to 15 percent slopes, eroded (HgC3).—This soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam and the soil is shallower over bedrock. Some of the original surface layer has been lost through erosion, and plowing exposes the subsoil. Limestone outcrop covers 2 to 10 percent of the surface area. Runoff is rapid.

Included with this soil in mapping were a few areas where limestone bedrock is at a depth of 10 to 40 inches. Also included were a few areas where the surface layer is silt loam.

This soil is suited to hay, pasture, and crops that require limited tillage. It is also suited to trees and wildlife habitat. Limestone outcrops, sinkholes, slope, and the hazard of contamination of ground water are limitations for some uses. Capability unit IVs-1.

Hagerstown silty clay, 8 to 15 percent slopes, eroded (HhC3).—The profile of this soil is similar to the one described as representative of the series, but the surface layer is silty clay. Much of the original surface layer has been removed by erosion. Runoff is rapid.

Included with this soil in mapping were small areas where the surface layer is silty clay loam. Also included were some small areas where limestone outcrop covers 3 to 5 percent of the surface.

This soil is suited to most crops commonly grown in the county. It is also suited to trees and wildlife habitat. Sinkholes, slope, and the hazard of contamination of ground water are limitations for some uses. Capability unit IIIe-3.

Hagerstown silty clay, 15 to 25 percent slopes, eroded (HhD3).—This soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay, and limestone bedrock is closer to the surface. Most of the original surface layer has been removed by erosion. Runoff is rapid.

Included with this soil in mapping were some small areas of Edom soils and a few areas where coarse fragments of chert occur throughout the profile. Also included were a few areas where limestone crops out.

This Hagerstown soil is better suited to hay, pasture, and crops that require limited tillage than to other uses. It is also suited to trees and wildlife habitat. Slope, sinkholes, and the hazard of contamination of ground water are limitations for most uses. Capability unit IVe-1.

Hagerstown-Rock outcrop complex, 0 to 8 percent slopes (HkB).—Hagerstown soils make up about 75 percent of this complex, and limestone outcrop the rest. The Hagerstown soil has a profile similar to the one described as representative of the Hagerstown series, but the surface layer is silty clay loam, and the soil is a few inches shallower over bedrock. Runoff is medium.

Included with this unit in mapping were a few areas where the surface layer is silt loam and some areas where bedrock is at a depth of 10 to 20 inches.

This unit is suited to limited pasture, trees, or wildlife habitat. Sinkholes, rock outcrop, and the hazard of contamination of ground water are limitations for most uses. Capability unit VIs-1.

Hagerstown-Rock outcrop complex, 8 to 30 percent slopes (HkD).—Hagerstown soils make up about 75 percent of this complex, and limestone outcrop the rest. The Hagerstown soil has a profile similar to the one described as representative of the Hagerstown series, but the surface layer is silty clay loam. Runoff is rapid.

Included with this unit in mapping were a few areas of steep soils in which bedrock is at a depth of 10 to 20 inches, a few areas of steep soils that have coarse fragments of chert throughout the profile, and a few areas where the surface layer is silty clay.

This unit is suited to limited pasture, trees, and wildlife habitat. Sinkholes, rock outcrop, slope, and the hazard of contamination of ground water are limitations for most uses. Capability unit VIs-1.

Hazleton Series

The Hazleton series consists of deep, nearly level to moderately steep, well-drained, moderately coarse textured soils on the sides and tops of mountains. These soils formed in material weathered from sandstone.

In a representative profile in a wooded area, the surface layer is very dark gray and yellowish-brown channery sandy loam, about 10 inches thick, that has a 1-inch covering of leaves. The subsoil extends to a depth of 42 inches. It is strong-brown, friable channery sandy loam in the upper 22 inches. Below this is 10 inches of light yellowish-brown, firm channery sandy loam. The substratum extends to a depth of 60 inches. It is light yellowish-brown, firm very channery sandy loam. Sandstone bedrock is at a depth of about 60 inches.

Hazleton soils are moderately rapidly permeable to rapidly permeable and low in available moisture capacity. Stoniness and the high content of coarse fragments are the main limitations. Most of the acreage is wooded. A few areas are idle or have been cleared and are used for pasture.

The Hazleton soils in Franklin County are mapped only with Dekalb soils.

Representative profile of Hazleton channery sandy loam in a wooded area of Dekalb and Hazleton extremely stony sandy loams, 0 to 8 percent slopes, 3 miles north of Edenville:

O1—1 inch to 0, litter of mainly oak leaves.

A1—0 to 2 inches, very dark gray (10YR 3/1) channery sandy loam; weak, very fine, granular structure; very friable, nonsticky and nonplastic; 35 percent coarse fragments; very strongly acid; abrupt, wavy boundary.

A2—2 to 10 inches, yellowish-brown (10YR 5/4) channery sandy loam; weak, fine, granular structure; very friable, nonsticky and nonplastic; 35 percent coarse fragments; very strongly acid; gradual, wavy boundary.

B1—10 to 18 inches, strong-brown (7.5YR 5/6) channery sandy loam; weak, medium, subangular blocky structure; friable, nonsticky and nonplastic; 35 percent coarse fragments; very strongly acid; clear, wavy boundary.

B21t—18 to 26 inches, strong-brown (7.5YR 5/8) channery sandy loam; weak, medium, subangular blocky structure; friable, nonsticky and nonplastic; few clay bridges between sand grains and in pores; 35 percent coarse fragments; very strongly acid; gradual, wavy boundary.

B22t—26 to 32 inches, strong-brown (7.5YR 5/6) channery sandy loam; weak, medium, subangular blocky structure; friable, nonsticky and nonplastic; some clay bridges between sand grains; 40 percent coarse fragments; very strongly acid; gradual, wavy boundary.

B3—32 to 42 inches, light yellowish-brown (10YR 6/4) channery sandy loam; weak, medium, subangular blocky structure; firm, nonsticky and nonplastic; 40 percent coarse fragments; very strongly acid; clear, wavy boundary.

C—42 to 60 inches, light yellowish-brown (10YR 6/4) very channery sandy loam; weak, fine, blocky structure; firm, nonsticky and nonplastic; 70 percent coarse fragments; very strongly acid; abrupt, wavy boundary.

R—60 inches, sandstone bedrock.

The solum ranges from 36 to 50 inches in thickness, and bedrock is at a depth of 4 to 6 feet or more. The A2 horizon ranges from gray to yellowish brown. The B1, B21t, B22t, and B3 horizons range from dark brown to brownish yellow and from loam to sandy loam. They are 35 to 65 percent coarse fragments. The B and C horizons range from strongly acid to extremely acid. The C horizon ranges from 7.5R to 2.5Y in hue and is 35 to 80 percent coarse fragments.

Hazleton soils are mingled with Dekalb soils. They are deeper over bedrock than those soils.

Highfield Series

The Highfield series consists of deep, gently sloping to very steep, well-drained, medium-textured soils on the tops and sides of mountains and in valleys between the mountains. These soils formed in material weathered from metabasalt, metarhyolite, and other light-colored rocks.

In a representative profile in a wooded area, the surface layer is very dark grayish-brown and pale-brown channery silt loam, about 9 inches thick, that has a 1-inch covering of partly decayed leaves. The subsoil is brown, friable channery silt loam and extends to a depth of 36 inches. The substratum extends to a depth of 55 inches and is dark-brown channery silt loam. Metarhyolite bedrock is at a depth of about 55 inches.

Highfield soils are moderately permeable and moderate in available moisture capacity. Coarse fragments, stoniness, and slope are the main limitations. Most of the acreage is wooded, but a few areas have been cleared and are used for pasture, hay, and fruit trees.

Representative profile of Highfield channery silt loam, 3 to 8 percent slopes, in a woodlot 1 mile east of the Post Office in South Mountain Village:

O1—1 inch to 0, partly decayed leaves.

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) channery silt loam; weak, fine, granular structure; very friable, nonsticky and nonplastic; 20 percent coarse fragments; strongly acid; abrupt, wavy boundary.

A2—4 to 9 inches, pale-brown (10YR 6/3) channery silt loam; weak, fine, granular structure; very friable, nonsticky and nonplastic; 20 percent coarse fragments; strongly acid; clear, wavy boundary.

B21t—9 to 17 inches, brown (7.5YR 5/4) channery silt loam; moderate, medium, subangular blocky structure; friable, slightly sticky, slightly plastic; common, thin clay films on ped faces; 25 percent coarse fragments; strongly acid; clear, wavy boundary.

B22t—17 to 28 inches, brown (7.5YR 5/4) channery silt loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; many, thin clay films on ped faces; 20 percent coarse fragments; strongly acid; clear, wavy boundary.

B3—28 to 36 inches, brown (7.5YR 5/4) channery silt loam; weak, fine, subangular blocky structure; friable, nonsticky and slightly plastic; 25 percent coarse fragments; strongly acid; gradual, wavy boundary.

C—36 to 55 inches, dark-brown (7.5YR 4/4) channery silt loam; weak, fine, subangular blocky structure; friable, nonsticky and slightly plastic; 45 percent coarse fragments; strongly acid; gradual, wavy boundary.

R—55 inches, metarhyolite bedrock.

The solum ranges from 20 to 40 inches in thickness, and bedrock is at a depth of 3½ to 6 feet. The B21t, B22t, and B3 horizons range from brown to yellowish brown and, in a few places, to olive yellow. The B and C horizons range from

strongly acid to very strongly acid. The C horizon is 30 to 80 percent coarse fragments.

Highfield soils are associated on the landscape with the deep, well drained Edgemont soils and the deep, somewhat poorly drained to moderately well drained Glenville soils. They have less sand in the Bt horizon than the Edgemont soils, and they are better drained than the Glenville soils.

Highfield channery silt loam, 3 to 8 percent slopes (HIB).—This soil has the profile described as representative of the series. Runoff is medium.

Included with this soil in mapping were a few areas of stony soils shown on the map by a stone spot symbol and a few areas where bedrock is at a depth of 20 to 40 inches. Also included, west of the Adams County, Pennsylvania, line was an area about 600 acres in size where the subsoil is red silty clay loam.

This Highfield soil is suited to most crops commonly grown in the county and to trees and wildlife habitat. Coarse fragments are a limitation for some uses. Capability unit IIe-2.

Highfield channery silt loam, 8 to 15 percent slopes (HIC).—This soil has a profile similar to the one described as representative of the series, but it has a plowed surface layer about 8 inches thick. Runoff is medium to rapid.

Included with this soil in mapping were a few areas where bedrock is at a depth of 20 to 40 inches. Also included, west of the Adams County, Pennsylvania, line was an area about 150 acres in size where the subsoil is red silty clay loam.

This Highfield soil is suited to most crops commonly grown in the county and to trees and wildlife habitat. Coarse fragments and slope are limitations for some uses. Capability unit IIIe-2.

Highfield extremely stony silt loam, 8 to 25 percent slopes (HmD).—This soil has a profile similar to the one described as representative of the series, but the surface layer has a 1- to 4-inch cover of organic materials. Runoff is medium to rapid. The surface layer is 3 to 15 percent stones 10 to 25 inches in size.

Included with this soil in mapping were a few areas where bedrock is at a depth of 20 to 40 inches. Also included, west of the Adams County, Pennsylvania, line was an area about 240 acres in size where the subsoil is red silty clay loam.

This Highfield soil is better suited to trees and wildlife habitat than to other uses. Stoniness, coarse fragments, and slope are limitations for most uses. Capability unit VIIs-1.

Highfield extremely stony silt loam, 25 to 70 percent slopes (HmF).—This soil has a profile similar to the one described as representative of the series, but the surface layer has a 1- to 4-inch cover of organic materials, and bedrock is a few inches closer to the surface. Runoff is rapid.

Included with this soil in mapping were a few areas where bedrock is at a depth of 20 to 40 inches.

This soil is better suited to trees and wildlife habitat than to other uses. Slope and stoniness are limitations for most uses. Capability unit VIIs-3.

Laidig Series

The Laidig series consists of deep, nearly level to very steep, well-drained, medium-textured and moderately coarse textured soils on mid and lower mountainsides. These soils formed in loamy colluvial material derived from sandstone and shale.

In a representative profile in a wooded area, the surface layer is dark grayish-brown and yellowish-brown channery sandy loam about 16 inches thick. The subsoil extends to a depth of 60 inches. It is yellowish-brown and strong-brown, very friable and friable channery sandy loam and channery sandy clay loam to a depth of 36 inches and strong-brown, firm and brittle channery sandy clay loam and channery clay loam mottled with yellowish red and pink in the lower part.

Laidig soils are moderately slowly permeable and moderate in available moisture capacity. The moderately slow permeability, coarse fragments, stoniness, and slope are the main limitations. Most of the acreage is wooded, but some areas have been cleared and are used for pasture, hay, and crops, and a few are used for fruit trees.

Representative profile of Laidig channery sandy loam in a wooded area of Laidig extremely stony sandy loam, 8 to 25 percent slopes, 3.75 miles southwest of Upper Strasburg on the Letterkenny Army Depot:

A1—0 to 2 inches, dark grayish-brown (10YR 4/2) channery sandy loam; single grained; loose, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; clear, smooth boundary.

A2—2 to 16 inches, yellowish-brown (10YR 5/6) channery sandy loam; weak, fine, granular structure; friable, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; gradual, smooth boundary.

B1—16 to 24 inches, yellowish-brown (10YR 5/6) channery sandy loam; weak, fine, subangular blocky structure; very friable, slightly sticky and slightly plastic; 20 percent coarse fragments; very strongly acid; gradual, wavy boundary.

B2t—24 to 36 inches, strong-brown (7.5YR 5/8) channery sandy clay loam; weak, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; 20 percent coarse fragments; very strongly acid; gradual, wavy boundary.

Bx1—36 to 46 inches, strong-brown (7.5YR 5/6) channery sandy clay loam that has yellowish-red (5YR 4/6) mottles; moderate, medium, platy structure; firm and brittle, slightly sticky and slightly plastic; 30 percent coarse fragments; very strongly acid; gradual, wavy boundary.

Bx2—46 to 60 inches, strong-brown (7.5YR 5/6) channery clay loam; few, medium, distinct, pink (7.5YR 7/4) and yellowish-red (5YR 4/8) mottles; moderate, thick, platy structure; firm and brittle, slightly sticky and plastic; few, thin, patchy clay films on ped faces; 35 percent coarse fragments; very strongly acid.

The solum ranges from 60 to 72 inches or more in thickness, and the fragipan is at a depth of 30 to 50 inches. The Ap horizon ranges from dark grayish brown to yellowish brown. The B1, B2t, Bx1, and Bx2 horizons are sandy clay loam, clay loam, loam, silt loam, and sandy loam and are channery. The B and C horizons range from strongly acid to extremely acid.

Laidig soils are associated on the landscape with the deep, moderately well drained to somewhat poorly drained Buchanan soils; the deep, well drained Murrill, Meckesville, and Bedington soils; the moderately deep, well drained Berks and Dekalb soils; the deep, poorly

drained Andover soils; and the shallow, well drained Weikert soils. Laidig soils have a Bx horizon, which does not occur in the Murrill and Bedington soils. Laidig soils do not have the inherited reddish colors that are characteristic of the Meckesville soils. They are deeper than the Berks, Dekalb, and Weikert soils, and they are better drained than the Andover and Buchanan soils.

Laidig extremely stony sandy loam, 0 to 8 percent slopes (LaB).—This soil has a profile similar to the one described as representative of the series, but it has a 1- to 2-inch covering of organic materials, and the subsoil is more silty. The surface layer is 3 to 15 percent stones 10 to 36 inches in size. Runoff is medium.

Included with this soil in mapping were a few areas of somewhat poorly drained soils, a few areas where the surface layer is gravelly loam, and a few areas where the surface layer is more than 15 percent stones.

This soil is better suited to trees and wildlife habitat than to other uses. Stoniness, moderately slow permeability, and coarse fragments are limitations for many uses. Capability unit VIIs-1.

Laidig extremely stony sandy loam, 8 to 25 percent slopes (LaD).—This soil has the profile described as representative of the series. The surface layer is 3 to 15 percent stones 10 to 36 inches in size. Runoff is medium.

Included with this soil in mapping were a few areas where more than 15 percent of the surface layer is stones, a few areas where the surface layer is gravelly loam, and a few areas of moderately well drained soils.

This soil is better suited to trees and wildlife habitat than to other uses. Stoniness, slope, moderately slow permeability, and coarse fragments are limitations for many uses. Capability unit VIIs-1.

Laidig extremely stony sandy loam, 25 to 45 percent slopes (LaE).—This soil has a profile similar to the one described as representative of the series, but it is somewhat less deep over bedrock. The surface layer is 3 to 15 percent stones 10 to 48 inches in size. Runoff is medium.

Included with this soil in mapping were small areas that do not have a fragipan, a few areas of Meckesville soils, and a few areas where the surface layer is gravelly loam.

This Laidig soil is better suited to trees and wildlife habitat than to other uses. Stoniness, slope, and moderately slow permeability are limitations for most uses. Capability unit VIIs-3.

Laidig gravelly loam, 3 to 8 percent slopes (LdB).—This soil has a profile similar to the one described as representative of the series, but it has a plowed surface layer of gravelly loam about 8 inches thick. Runoff is medium.

Included with this soil in mapping were a few areas of nearly level Laidig soils and a few areas of moderately well drained soils. Also included were a few areas where the surface layer is cobbly and a few areas where shale bedrock is at a depth of about 3 feet.

This Laidig soil is suited to most crops grown in the county and to trees and wildlife habitat. Coarse fragments, slope, and moderately slow permeability are limitations for some uses. Capability unit IIe-2.

Laidig gravelly loam, 8 to 15 percent slopes (LdC).—This soil has a profile similar to the one described as representative of the series, but it has a plowed surface layer of gravelly loam about 8 inches thick, and some of the original surface layer has been lost through erosion. Runoff is medium.

Included with this soil in mapping were small areas where nearly all of the original surface layer has been lost through erosion and a few areas where the surface layer is cobbly.

This soil is suited to most crops commonly grown in the county and to trees and wildlife habitat. Coarse fragments, slope, and moderately slow permeability are limitations for some uses. Capability unit IIIe-2.

Leetonia Series

The Leetonia series consists of moderately deep, nearly level to sloping, well-drained to excessively drained, coarse-textured soils on mountaintops. These soils formed in material weathered from sandstone, quartzite, or conglomerate.

In a representative profile in a wooded area, the surface layer is black and gray very channery loamy sand, about 9 inches thick, that has a 7-inch covering of leaves and decomposed leaves and twigs. The subsoil is dark reddish-brown and yellowish-brown, friable and loose channery loamy sand that extends to a depth of 24 inches. The substratum extends to a depth of 34 inches and is yellowish-brown very channery loamy sand. Sandstone bedrock is at a depth of about 34 inches.

Leetonia soils are moderately rapidly permeable and low in available moisture capacity. Stoniness and depth to bedrock are the main limitations. These soils are wooded.

Representative profile of Leetonia very channery loamy sand in an area of Leetonia extremely stony loamy sand, 0 to 12 percent slopes, in a wooded area 2 miles north of Edenville:

O1—7 to 4 inches, light-brown (7.5YR 6/4) leaf mat.

O2—4 inches to 0, very dark gray (10YR 3/1) decomposed organic mat of leaves and twigs.

A1—0 to 2 inches, black (10YR 2/1) very channery loamy sand; single grained; loose, nonsticky and nonplastic; 50 percent coarse fragments; very strongly acid; gradual, wavy boundary.

A2—2 to 9 inches, gray (10YR 5/1) very channery loamy sand; single grained; loose, nonsticky and nonplastic; 50 percent coarse fragments; very strongly acid; gradual, wavy boundary.

B2h—9 to 12 inches, dark reddish-brown (5YR 3/4) channery loamy sand; weak, fine, granular structure; friable, nonsticky and nonplastic; 35 percent coarse fragments; very strongly acid; clear, irregular boundary.

B3—12 to 24 inches, yellowish-brown (10YR 5/4) channery loamy sand; weak, fine, granular structure; loose, nonsticky and nonplastic; 40 percent coarse fragments; very strongly acid; clear, wavy boundary.

C—24 to 34 inches, yellowish-brown (10YR 5/6) very channery loamy sand; single grained; very friable, nonsticky and nonplastic; 65 percent coarse fragments; very strongly acid; gradual, wavy boundary.

R—34 inches, sandstone bedrock.

The solum ranges from 24 to 34 inches in thickness, and bedrock is at a depth of 2½ to 3½ feet. The soil ranges from extremely acid to very strongly acid throughout. The B2h horizon ranges from yellowish brown to dark reddish brown and is 35 to 65 percent coarse fragments.

The Leetonia soils in Franklin County are shallower over bedrock than is defined for the series. This difference does not alter the usefulness or behavior of the soils.

Leetonia soils are associated on the landscape with the deep, well-drained Hazleton soils; the moderately deep, well-drained Dekalb soils; and the moderately deep, excessively drained to well-drained Lehew soils. They have a thicker A2 horizon and a more sandy B horizon than the Dekalb soils; they have a yellowish-colored B horizon that is absent from the Lehew soils; and they are not so deep over bedrock as the Hazleton soils.

Leetonia extremely stony loamy sand, 0 to 12 percent slopes (LeB).—This soil has stones over 3 to 15 percent of the surface area. Runoff is slow.

Included with this soil in mapping were small areas of Dekalb soils, a few areas where the surface is covered with more than 15 percent stones, and a few areas where bedrock is at a depth of more than 40 inches.

This Leetonia soil is suited to trees and wildlife habitat. Stoniness and depth to bedrock are limitations for most uses. Capability unit VIIs-1.

Lehew Series

The Lehew series consists of moderately deep, sloping to very steep, well-drained to excessively drained, medium-textured soils on mountainsides. These soils formed in material weathered from reddish-colored sandstone, siltstone, and shale.

In a representative profile in a wooded area, the surface layer is dark-gray and weak-red very channery fine sandy loam and very channery loam, about 7 inches thick, that has a 2-inch covering of leaves and moss. The subsoil is reddish-brown, friable very channery loam and extends to a depth of 23 inches. The substratum extends to a depth of 28 inches and is reddish-brown very channery fine sandy loam. Sandstone bedrock is at a depth of about 28 inches.

Lehew soils are moderately permeable to rapidly permeable and low in available moisture capacity. Stoniness, slope, and depth to bedrock are the main limitations. Nearly all the acreage is wooded.

Representative profile of Lehew very channery loam in a wooded area of Dekalb and Lehew extremely stony soils, 25 to 75 percent slopes, 1 mile north of Cowans Gap Lake on the east slope of Tuscarora Mountain:

O1—2 inches to 0, leaves and patches of moss.

A1—0 to 1 inch, dark-gray (10YR 4/1) very channery fine sandy loam; weak, very fine, granular structure; very friable, nonsticky and nonplastic; 60 percent coarse fragments; very strongly acid; abrupt, wavy boundary.

A2—1 to 7 inches, weak-red (2.5YR 5/2) very channery loam; weak, medium, granular structure; friable, slightly sticky and slightly plastic; 60 percent coarse fragments; very strongly acid; clear, wavy boundary.

B21t—7 to 16 inches, reddish-brown (2.5YR 4/4) very channery loam; weak, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; 60 percent coarse fragments; very strongly acid; clear, wavy boundary.

B22t—16 to 23 inches, reddish-brown (2.5YR 4/4) very channery loam; weak, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; 60 percent coarse fragments; very strongly acid; gradual, wavy boundary.

C—23 to 28 inches, reddish-brown (2.5YR 4/4) very channery fine sandy loam; single grained; very friable, nonsticky and nonplastic; 90 percent coarse fragments; very strongly acid; gradual, irregular boundary.

R—28 inches, dusky-red (10R 3/3) sandstone bedrock.

The solum ranges from 15 to 28 inches in thickness, and bedrock is at a depth of 1½ to 3½ feet. The soil ranges from very strongly acid to strongly acid throughout. The B horizon ranges from reddish brown to yellowish red and is 30 to 60 percent coarse fragments.

Lehew soils are associated on the landscape with the moderately deep, well-drained Dekalb soils; the moderately deep, well-drained to excessively drained Leetonia soils; and the deep, well-drained Hazleton, Laidig, and Meckesville soils. Lehew soils do not have the Bx horizon that is characteristic of the Laidig and Meckesville soils. They have a reddish-colored B horizon that does not occur in the Dekalb, Hazleton, and Leetonia soils.

Lehew extremely stony loam, 8 to 25 percent slopes (LhD).—This soil has a profile similar to the one described as representative of the series, but the surface layer contains fewer coarse fragments. The surface layer is 3 to 15 percent stones 10 to 40 inches in size. Runoff is slow.

Included with this soil in mapping were a few areas where the surface layer is more than 15 percent stones and a few areas where bedrock is at a depth of more than 40 inches.

This soil is better suited to trees and wildlife habitat than to other uses. Stoniness and depth to bedrock are limitations for many uses. Capability unit VIIs-1.

Markes Series

The Markes series consists of moderately deep, nearly level and gently sloping, poorly drained, medium-textured soils on upland flats. These soils formed in material weathered from noncalcareous shale.

In a representative profile in a cultivated area, the plow layer is dark grayish-brown shaly silt loam about 11 inches thick. The subsoil extends to a depth of 27 inches. It is light olive-gray, firm very shaly clay loam and very shaly loam mottled with light yellowish brown, strong brown, yellowish brown, and grayish brown. The substratum extends to a depth of 32 inches and is olive-gray very shaly loam. Shale bedrock is at a depth of about 32 inches.

Markes soils are slowly permeable and low in available moisture capacity. A high water table is at or near the surface during much of the year. The slow permeability, coarse fragments, depth to bedrock, and high water table are limitations for most uses. Most of the acreage has been cleared and is used for hay, pasture, and crops.

Representative profile of Markes shaly silt loam, 2 to 8 percent slopes, in a cultivated field seven-eighths mile northeast of Freys along Route T543:

Ap—0 to 11 inches, dark grayish-brown (2.5Y 4/2) shaly silt loam; weak, fine, granular structure; friable, slightly sticky and slightly plastic; 15 percent coarse fragments; neutral; abrupt, smooth boundary.

B21tg—11 to 20 inches, light olive-gray (5Y 6/2) very shaly clay loam; many, medium, prominent, strong-brown (7.5YR 5/6) and light yellowish-brown (10YR 6/4) mottles; moderate, fine and medium, angular and subangular blocky structure; firm, sticky and slightly plastic; many, thick, patchy clay films on ped faces; 55 percent coarse fragments; neutral; clear, wavy boundary.

B22tg—20 to 27 inches, light olive-gray (5Y 6/2) very shaly loam; many, medium, prominent, yellowish-brown

(10YR 5/6) and grayish-brown (2.5Y 5/2) mottles; moderate, fine, subangular blocky structure modified by shale fragments; firm, sticky and slightly plastic; few, thin, patchy clay films on ped faces; 65 percent coarse fragments; strongly acid; clear, wavy boundary.

Cg—27 to 32 inches, olive-gray (5Y 4/2) very shaly loam; massive; 80 percent coarse fragments; strongly acid; clear, irregular boundary.

R—32 inches, dark grayish-brown (2.5Y 4/2), fractured, noncalcareous shale bedrock.

The solum ranges from 18 to 36 inches in thickness, and bedrock is at a depth of 1½ to 3½ feet. The Ap horizon ranges from very dark grayish brown to olive. The B21tg and B22tg horizons range from dark gray to light olive gray and are 35 to 80 percent coarse fragments. The C horizon ranges from very shaly loam to very shaly silty clay loam.

Markes soils are associated on the landscape with the shallow, well drained Weikert soils; the moderately deep, well drained Berks soils; and the moderately deep, somewhat poorly drained to moderately well drained Blairton soils. They are wetter than the Blairton soils, and they are not so well drained as the Berks and Weikert soils.

Markes shaly silt loam, 2 to 8 percent slopes (MaB).—Runoff is medium on this soil. Included in mapping were a few areas of a more sloping soil, a few areas where nearly all of the original surface layer has been lost through erosion, and a few areas of a soil that has a surface layer of silty clay loam.

This soil is better suited to hay, pasture, trees, crops tolerant of wetness, and wildlife habitat than to other uses. Artificial drainage increases suitability for crops. Depth to bedrock, coarse fragments, slow permeability, and a high water table are limitations for most uses. Capability unit IVw-3.

Meckesville Series

The Meckesville series consists of deep, sloping and moderately steep, well-drained, medium-textured soils on mid and lower mountainsides. These soils formed in colluvial material derived from red sandstone, siltstone, and shale.

In a representative profile in a wooded area, the surface layer is reddish-gray and reddish-brown channery loam, and is about 9 inches thick, and has a 2-inch covering of leaves and decayed leaves and twigs. The subsoil extends to a depth of 65 inches. It is reddish-brown and dark reddish-brown, friable and firm silty clay loam, heavy loam, and channery heavy loam to a depth of 36 inches and dark-red, red, and reddish-brown, firm and brittle channery loam mottled with pale red, red, and yellowish brown in the lower part.

Meckesville soils are moderately slowly permeable and moderate to high in available moisture capacity. Stoniness, the moderately slow permeability, and slope are the main limitations. Nearly all the acreage is wooded.

Representative profile of Meckesville channery loam in a wooded area of Meckesville extremely stony loam, 8 to 25 percent slopes, one-half mile northeast of Bear Valley State Park:

O1—2 inches to 1 inch, hardwood leaf litter.

O2—1 inch to 0, black (N 2/0) mat of decayed leaves and twigs.

A1—0 to 2 inches, reddish-gray (5YR 5/2) channery loam; weak, fine, granular structure; very friable, nonsticky and nonplastic; 25 percent coarse fragments; very strongly acid; clear, wavy boundary.

A2—2 to 9 inches, reddish-brown (5YR 4/3) loam; weak, medium, subangular blocky structure; very friable, slightly sticky and nonplastic; 10 percent coarse fragments; very strongly acid; clear, wavy boundary.

B21t—9 to 16 inches, reddish-brown (2.5YR 5/4) silty clay loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; 10 percent coarse fragments; very strongly acid; gradual, wavy boundary.

B22t—16 to 25 inches, reddish-brown (2.5YR 4/4) heavy loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, discontinuous clay films on ped faces; 10 percent coarse fragments; very strongly acid; gradual, wavy boundary.

B23t—25 to 36 inches, dark reddish-brown (2.5YR 3/4) channery heavy loam; moderate, medium, subangular blocky structure; firm, slightly sticky and nonplastic; few, thin, discontinuous clay films on ped faces; few black coatings on ped faces; 15 percent coarse fragments; very strongly acid; gradual, wavy boundary.

Bx1—36 to 44 inches, dark-red (2.5YR 3/6) channery loam; weak, medium, platy structure; firm and brittle, slightly sticky and nonplastic; few black coatings on ped faces; 15 percent coarse fragments; very strongly acid; clear, wavy boundary.

Bx2—44 to 52 inches, red (2.5YR 4/6) channery loam; few, medium, distinct, pale-red (10R 6/2) and red (2.5YR 4/8) mottles; moderate, medium, platy structure; firm and brittle, slightly sticky and nonplastic; few black coatings on ped faces; 15 percent coarse fragments; very strongly acid; gradual, wavy boundary.

Bx3—52 to 65 inches, reddish-brown (2.5YR 4/4) channery loam; few, medium, distinct, yellowish-brown (10YR 5/4) mottles; moderate, coarse, blocky structure; firm and brittle, nonsticky and nonplastic; 15 percent coarse fragments; very strongly acid.

The solum ranges from 45 to 70 inches in thickness, and bedrock is at a depth of 5 to 20 feet. The soil ranges from strongly acid to very strongly acid throughout. The B21t, B22t, and B23t horizons range from dark reddish brown to red and from heavy loam to channery or gravelly silty clay loam.

Meckesville soils are associated on the landscape with the moderately deep, well drained to excessively drained Lehew soils; the deep, well drained Laidig soils; the deep, moderately well drained to somewhat poorly drained Buchanan soils; and the deep, poorly drained Andover soils. Meckesville soils do not have the yellowish colors that are characteristic of the Laidig soils; they are deeper than the Lehew soils; and they are better drained than the Buchanan and Andover soils.

Meckesville extremely stony loam, 8 to 25 percent slopes (McD).—This soil has a surface layer that is 3 to 15 percent stones 10 to 36 inches in size. Runoff is medium.

Included with this soil in mapping were a few areas of Lehew soils, a few areas where the surface layer is silt loam, and some areas where the surface layer is more than 15 percent stones.

This Meckesville soil is better suited to trees and wildlife habitat than to other uses. Stoniness, slope, and moderately slow permeability are limitations. Capability unit VIIs-1.

Melvin Series

The Melvin series consists of deep, nearly level, poorly drained, medium-textured soils on flood plains. These soils formed in stream deposits washed from uplands underlain by limestone and calcareous shale.

In a representative profile in a cultivated area, the plow layer is dark grayish-brown silt loam about 10 inches thick. It is mottled in the lower part with dark brown. The subsoil is grayish-brown and dark grayish-brown, friable silt loam and silty clay loam mottled with dark brown. It extends to a depth of 36 inches. The substratum extends to a depth of 68 inches and is dark grayish-brown and dark-gray, friable silt loam. Stratified silt and sand is between depths of about 68 and 72 inches.

Melvin soils are moderately permeable and high in available moisture capacity. A water table is at or near the surface most of the year. Flooding and the high water table are the main limitations. Most of the acreage has been cleared and is used for hay and pasture. A few areas are idle, wooded, or used for crops.

The Melvin soils in Franklin County are mapped only with Atkins soils.

Representative profile of Melvin silt loam in a pastured area of Atkins and Melvin silt loams, one-third mile northwest of Five Forks:

Ap1—0 to 2 inches, dark grayish-brown (2.5Y 4/2) silt loam; weak, fine, granular structure; friable, nonsticky and nonplastic; neutral; clear, wavy boundary.

Ap2—2 to 10 inches, dark grayish-brown (2.5Y 4/2) silt loam; few, fine, distinct, dark-brown (7.5YR 4/4) mottles; weak, fine, granular structure; friable, slightly sticky and slightly plastic; neutral; clear, wavy boundary.

B21g—10 to 22 inches, grayish-brown (10YR 5/2) silt loam; common, medium, distinct, dark-brown (10YR 4/3) mottles; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; neutral; clear, wavy boundary.

B22g—22 to 36 inches, dark grayish-brown (10YR 4/2) silty clay loam; common, medium, distinct, dark-brown (10YR 4/3) mottles; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; few sandy loam lenses; neutral; clear, wavy boundary.

C1g—36 to 62 inches, dark grayish-brown (2.5Y 4/2) silt loam; common, medium, prominent, dark-gray (10YR 4/1), dark yellowish-brown (10YR 4/4), and black (10YR 2/1) mottles; weak, medium, blocky structure; friable, slightly sticky and nonplastic; less than 5 percent coarse fragments; neutral; gradual, wavy boundary.

C2g—62 to 68 inches, dark-gray (5Y 4/1) silt loam; common, medium, distinct, dark-gray (N 4/0) and black (5Y 2/1) mottles; massive; friable, slightly sticky and nonplastic; less than 5 percent coarse fragments; neutral; abrupt, wavy boundary.

IIC3—68 to 72 inches, stratified silt and sand.

The solum ranges from 20 to 40 inches in thickness. The Ap horizon ranges from dark gray to grayish brown. The Ap2 horizon is mottled with dark brown, yellowish brown, or yellowish red. The B21g and B22g horizons range from dark grayish brown to gray and are 0 to 5 percent coarse fragments. The C horizon ranges from 2 to 20 percent coarse fragments.

Melvin soils are associated on the landscape with the moderately well drained to somewhat poorly drained Dunning overwash variant soils and the very poorly drained to poorly drained Dunning soils on flood plains. They are wetter than the Dunning overwash variant soils, and they are better drained than the Dunning soils.

Monongahela Series

The Monongahela series consists of deep, gently sloping, moderately well drained, medium-textured soils on terraces. These soils formed in old alluvium washed from uplands underlain by acid sandstone and shale.

In a representative profile in a cultivated area, the plow layer is dark-brown silt loam about 7 inches thick. The subsoil extends to a depth of 55 inches. The upper 15 inches is yellowish-brown, friable and firm silt loam and light silty clay loam mottled in the lower part with grayish brown and very pale brown; the lower part is yellowish-brown and light yellowish-brown, firm and brittle silty clay loam mottled with light brownish gray, brown, and yellowish brown. The substratum to a depth of 66 inches is grayish-brown clay loam.

Monongahela soils are slowly permeable and moderate in available moisture capacity. A seasonal high water table rises to within 1½ to 3 feet of the surface during wet periods. The seasonal high water table and slow permeability are the main limitations. Most of the acreage has been cleared and is used for crops. A few areas are idle or wooded.

Representative profile of Monongahela silt loam, 3 to 8 percent slopes, in a cultivated field about 2 miles southeast of Williamson:

Ap—0 to 7 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; neutral; clear, smooth boundary.

B21t—7 to 17 inches, yellowish-brown (10YR 5/8) silt loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; slightly acid; gradual, wavy boundary.

B22t—17 to 22 inches, yellowish-brown (10YR 5/8) light silty clay loam; few, medium, distinct, grayish-brown (10YR 5/2) and very pale brown (10YR 7/4) mottles; moderate, medium, subangular blocky structure; firm, sticky and slightly plastic; few, thick, patchy clay films on ped faces; medium acid; gradual, wavy boundary.

Bx1—22 to 45 inches, yellowish-brown (10YR 5/6) silty loam; common, coarse, distinct, light brownish-gray (10YR 6/2) and brown (10YR 5/3) mottles; moderate, medium, platy structure; firm and brittle, sticky and plastic; many, thick, continuous clay films on ped faces; strongly acid; gradual, wavy boundary.

Bx2—45 to 55 inches, light yellowish-brown (10YR 6/4) silty clay loam; common, coarse, distinct, yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) mottles; strong, medium, platy structure; firm and brittle, sticky and plastic; many, thick, continuous clay films on ped faces; strongly acid; gradual, wavy boundary.

IIC—55 to 66 inches, grayish-brown (2.5Y 5/2) clay loam that has streaks of brownish yellow (10YR 6/6); massive; firm, sticky and plastic; 10 percent coarse fragments; strongly acid.

The solum ranges from 40 to 60 inches in thickness, and the fragipan is at a depth of 18 to 30 inches. The B horizon is loam, silty clay loam, clay loam, and sandy clay loam.

Monongahela soils are associated on the landscape with the deep, well-drained Allegheny soils; the deep, somewhat poorly drained Tyler soils; and the deep,

poorly drained to very poorly drained Purdy soils on terraces. The Pope, Philo, and Atkins soils are on nearby flood plains. Monongahela soils are not so well drained as the Allegheny soils, and they are better drained than the Tyler and Purdy soils.

Monongahela silt loam, 3 to 8 percent slopes (MoB).—Runoff on this soil is medium. Included in mapping were a few areas of better drained soils and a few areas where nearly all of the original surface layer has been lost through erosion.

This soil is suited to crops somewhat tolerant of wetness and to trees and wildlife habitat. Artificial drainage increases suitability for crops. The seasonal high water table and slow permeability are limitations for most uses. Capability unit IIe-5.

Murrill Series

The Murrill series consists of deep, nearly level to moderately steep, well-drained, medium-textured and moderately coarse textured soils on fans, benches, and side slopes in uplands. These soils formed in colluvial material derived from sandstone and shale underlain by material weathered from limestone.

In a representative profile in a cultivated area, the plow layer is dark-brown gravelly loam about 10 inches thick. The next layer is yellowish-brown, friable gravelly loam about 5 inches thick. The subsoil extends to a depth of 90 inches. It is dark-brown and strong-brown, friable clay loam to a depth of 55 inches and yellowish-red, firm silty clay loam mottled with red between depths of 55 and 62 inches. Below this, it is yellowish-red silty clay loam.

Murrill soils are moderately permeable and high in available moisture capacity. Coarse fragments, complex slopes, stoniness, sinkholes, and the hazard of contamination of ground water are limitations for some uses. Much of the acreage has been cleared and is used for crops and fruit trees. Some areas, particularly cobbly and extremely stony ones, are wooded or idle. Some sandy loam areas have been used as a source of fill material.

Representative profile of Murrill gravelly loam, 3 to 8 percent slopes, in a cultivated field 1 mile northeast of Edenville:

Ap—0 to 10 inches, dark-brown (10YR 4/3) gravelly loam; weak, fine, granular structure; friable, slightly sticky and slightly plastic; 20 percent coarse fragments; neutral; abrupt, smooth boundary.

A2—10 to 15 inches, yellowish-brown (10YR 5/6) gravelly loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; 20 percent coarse fragments; neutral; clear, wavy boundary.

B21t—15 to 24 inches, dark-brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; thin, discontinuous clay films on ped faces; 10 percent coarse fragments; slightly acid; clear, wavy boundary.

B22t—24 to 55 inches, strong-brown (7.5YR 5/6) clay loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; few, thin, discontinuous clay films on ped faces; 10 percent coarse fragments; medium acid; clear, wavy boundary.

B23t—55 to 62 inches, yellowish-red (5YR 5/8) silty clay loam; few, coarse, faint, red (2.5YR 4/6) mottles; moderate, medium, blocky structure; firm, slightly sticky and plastic; few, thin, discontinuous clay films on ped faces; medium acid; gradual, wavy boundary.

B24t—62 to 90 inches, yellowish-red (5YR 5/6) silty clay loam; moderate, medium, blocky structure; firm, slightly sticky and slightly plastic; few, thick, continuous clay films on ped faces; medium acid.

The Ap horizon ranges from dark brown to dark yellowish brown and is cobbly sandy loam, gravelly loam, and gravelly sandy loam. The A2 horizon ranges from brown to brownish yellow and from loam to silt loam. The B21t and B22t horizons are silty clay loam, sandy clay loam, and clay loam. The B23t and B24t horizons range from yellowish red to red and are clay loam, silty clay loam, silty clay, and clay.

The Murrill soils in Franklin County have a higher reaction throughout the profile than is defined for the series. This difference does not alter the usefulness or behavior of the soils.

Murrill soils are associated on the landscape with the deep, well drained Duffield, Edom, Hagerstown, and Laidig soils; the moderately deep, well drained Berks soils; the deep, moderately well drained Clarksburg soils; the deep, moderately well drained to somewhat poorly drained Buchanan soils; and the deep, poorly drained Andover soils. Murrill soils have more sand in the Bt horizon than the Duffield, Edom, and Hagerstown soils; they do not have the Bx horizon that is characteristic of the Laidig soils; they are deeper than the Berks soils; and they are better drained than the Clarksburg, Buchanan, and Andover soils.

Murrill gravelly sandy loam, 3 to 8 percent slopes (MrB).—This soil has a profile similar to the one described as representative of the series, but the surface layer is gravelly sandy loam. Runoff is medium.

Included with this soil in mapping were a few areas of Laidig and Buchanan soils. Also included, in depressions, were some areas of Andover soils.

This Murrill soil is suited to most crops commonly grown in the county, to fruit trees and other trees, and to wildlife habitat. Coarse fragments, sinkholes, slope, and hazard of contamination of ground water are the main limitations. Capability unit IIe-4.

Murrill gravelly sandy loam, 8 to 15 percent slopes (MrC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is gravelly sandy loam. Runoff is medium to rapid.

Included with this soil in mapping were a few areas of Laidig and Buchanan soils and a few wooded areas that have a thin organic surface layer. Also included, in small depressions, were some areas of Andover soils.

This Murrill soil is suited to most crops commonly grown in the county, to fruit trees and other trees, and to wildlife habitat. Slope, coarse fragments, sinkholes, and the hazard of contamination of ground water are limitations for some uses. Capability unit IIIe-4.

Murrill cobbly sandy loam, 3 to 8 percent slopes (MuB).—This soil has a profile similar to the one described as representative of the series, but the surface layer is cobbly sandy loam. Runoff is medium.

Included with this soil in mapping were small areas of Buchanan and Laidig soils. Also included, in small depressions, were some areas of Andover soils.

This Murrill soil is suited to most crops commonly grown in the county, to fruit trees and other trees, and to wildlife habitat. Cobblestones, sinkholes, slope, and the hazard of contamination of ground water are limitations for some uses. Capability unit IIIs-1.

Murrill cobbly sandy loam, 8 to 15 percent slopes (MuC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is cobbly sandy loam and about 3 inches thinner. Runoff is medium.

Included with this soil in mapping were a few areas of Buchanan and Laidig soils and a few areas where nearly all of the original surface layer has been lost through erosion. Also included, in small depressions, were some areas of Andover soils.

This Murrill soil is suited to most crops commonly grown in the county, to fruit trees and other trees, and to wildlife habitat. Cobblestones, sinkholes, slope, and the hazard of contamination of ground water are the main limitations. Capability unit IVs-2.

Murrill extremely stony sandy loam, 0 to 8 percent slopes (MvB).—This soil has a profile similar to the one described as representative of the series, but it has a thin organic surface layer. The surface layer is 3 to 15 percent stones 10 to 25 inches in size. Runoff is medium.

Included with this soil in mapping were a few areas of Laidig and Buchanan soils. Also included, in depressions, were a few areas of Andover soils.

This Murrill soil is better suited to trees and wildlife habitat than to other uses. Stoniness, sinkholes, and the hazard of contamination of ground water are the main limitations. Capability unit VIIs-1.

Murrill extremely stony sandy loam, 8 to 25 percent slopes (MvD).—This soil has a profile similar to the one described as representative of the series, but it has a thin organic surface layer. The surface layer is 3 to 15 percent stones 10 to 30 inches in size. Runoff is rapid.

Included with this soil in mapping were a few areas of Laidig soils and a few areas where the surface layer is more than 15 percent stones. Also included, in depressions, were a few areas of Andover soils.

This Murrill soil is better suited to trees and wildlife habitat than to other uses. Stoniness, sinkholes, slope, and the hazard of contamination of ground water are limitations for most uses. Capability unit VIIs-1.

Murrill gravelly loam, 0 to 3 percent slopes (MwA).—This soil has a profile similar to the one described as representative of the series, but it is shallower over bedrock, and the subsoil contains more gravel. Runoff is medium.

Included with this soil in mapping were a few areas of Buchanan soils and (fig. 21), in depressions, a few areas of Andover soils.

This Murrill soil is suited to the crops commonly grown in the county, to fruit trees and other trees, and to wildlife habitat. Coarse fragments, sinkholes, and the

Figure 21.—**Murrill gravelly loam and the included dark-colored Andover soil.**

hazard of contamination of ground water are the main limitations. Capability unit I–2.

Murrill gravelly loam, 3 to 8 percent slopes (MwB).—This soil has the profile described as representative of the series. Runoff is medium.

Included with this soil in mapping were a few areas where most of the original surface layer has been removed by erosion and a few areas of rocky Hagerstown soils. Also included were a few areas of Laidig and Buchanan soils.

This Murrill soil is suited to the crops commonly grown in the county, to fruit trees and other trees, and to wildlife habitat. Coarse fragments, sinkholes, and the hazard of contamination of ground water are the main limitations. Capability unit IIe–1.

Murrill gravelly loam, 8 to 15 percent slopes (MwC).—This soil has a profile similar to the one described as representative of the series, but it is shallower over bedrock. Runoff is medium to rapid.

Included with this soil in mapping were a few areas of rocky Hagerstown soils and a few wooded areas that have a thin organic surface layer. Also included, in small depressions, were some areas of Andover soils.

This Murrill soil is suited to most crops commonly grown in the county, to fruit trees and other trees, and to wildlife habitat. Slope, sinkholes, coarse fragments, and the hazard of contamination of ground water are limitations for many uses. Capability unit IIIe–1.

Nolin Series

The Nolin series consists of deep, nearly level, well-drained, medium-textured soils on local flood plains in the uplands. These soils are in drainageways and depressions that in many places are poorly defined. They formed in material washed from surrounding soils, mostly Hagerstown soils.

In a representative profile in a cultivated area, the plow layer is dark-brown silt loam about 12 inches thick. The subsoil extends to a depth of 60 inches. It is dark-brown and dark yellowish-brown, very friable silt loam to a depth of 41 inches and yellowish-brown silty clay loam and silty clay in the lower part.

Nolin soils are moderately permeable and high in available moisture capacity. Flooding is a limitation for some uses. Nearly all the acreage has been cleared and is used for crops.

Representative profile of Nolin silt loam, local alluvium, in a cultivated field 2⅛ miles northeast of Waynesboro and one-half mile east of Legislative Route 28023:

Ap—0 to 12 inches, dark-brown (10YR 4/3) silt loam; weak, medium, granular structure; very friable, slightly sticky and slightly plastic; slightly acid; abrupt, smooth boundary.

B21—12 to 30 inches, dark-brown (10YR 4/3) silt loam; weak, fine, subangular blocky structure; very friable, slightly sticky and slightly plastic; slightly acid; gradual, wavy boundary.

B22—30 to 41 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, subangular blocky structure; very friable, slightly sticky and slightly plastic; neutral; gradual, wavy boundary.

IIB21b—41 to 52 inches, yellowish-brown (10YR 5/8) silty clay loam; moderate, medium, subangular blocky structure; friable, sticky and plastic; few, thin silt coats on ped faces; slightly acid; gradual, wavy boundary.

IIB22b—52 to 60 inches, yellowish-brown (10YR 5/8) silty clay; moderate, medium, subangular blocky structure; firm, sticky and plastic; many, thick, dark reddish-brown (5YR 3/4) clay films on ped faces; slightly acid.

The solum ranges from 40 to 70 inches in thickness. Contrasting material is at a depth of 40 to 50 inches, and bedrock is at a depth of 5 to 15 feet or more. The Ap horizon ranges from dark brown to brown. The B21 and B22 horizons range from dark brown to yellowish brown or dark yellowish brown. The IIB21b and IIB22b horizons range from yellowish brown to yellowish red and from silty clay loam to clay.

Nolin soils are associated on the landscape with the deep, moderately well drained Clarksburg soils; the deep, somewhat poorly drained Penlaw soils; and the deep, well drained Hagerstown and Duffield soils. Nolin soils have a IIB horizon that does not occur in those soils, and they are better drained than the Clarksburg and Penlaw soils.

Nolin silt loam, local alluvium (No).—This nearly level soil is in narrow, low positions that receive runoff from surrounding slopes. As much as a foot or more of water sometimes accumulates in these areas and stands for a short time during periods of heavy rainfall. Runoff is slow.

Included with this soil in mapping were small areas that are mottled at a depth of 20 to 30 inches. Also included are areas where contrasting material is at a depth of less than 40 inches.

This soil is suited to the crops commonly grown in the county and to trees and wildlife habitat. Local flooding is a limitation for some uses. Capability unit I–1.

Penlaw Series

The Penlaw series consists of deep, nearly level, somewhat poorly drained, medium-textured soils in concave areas on uplands. These soils formed in colluvium derived from shale, limestone, and sandstone.

In a representative profile in a cultivated area, the plow layer is dark grayish-brown silt loam about 10 inches thick. The subsoil extends to a depth of 50 inches. It is yellowish-brown, firm silty clay loam mottled with grayish brown to a depth of 23 inches and yellowish-brown, firm and brittle light silty clay loam mottled with brown, light gray, light brownish gray, and strong brown in the lower part. The substratum to a depth of 61 inches is brown silty clay.

Penlaw soils are slowly permeable and moderate in available moisture capacity. A seasonal high water table rises to within ½ foot to 1½ feet of the surface during wet periods. The seasonal high water table, sinkholes, and slow permeability are the main limitations. Most of the acreage has been cleared and is used for pasture, hay, or crops. A few areas are idle or wooded.

Representative profile of Penlaw silt loam in a hayfield, 1.6 miles south of Lemasters:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable, slightly sticky and slightly plastic; slightly acid; abrupt, smooth boundary.

B2t—10 to 23 inches, yellowish-brown (10YR 5/4) silty clay loam; common, fine, faint, grayish-brown (10YR 5/2) mottles; moderate, medium, blocky structure;

firm, slightly sticky and plastic; common, thin clay films on ped faces; neutral; clear, wavy boundary.

Bx1—23 to 35 inches, yellowish-brown (10YR 5/6) light silty clay loam; many, medium, distinct, brown (10YR 5/3) and light-gray (10YR 7/1) mottles; weak, very coarse, prismatic structure parting to moderate, medium, platy; firm and brittle, slightly sticky and plastic; many, thick clay films and black coatings on plate faces; neutral; gradual, wavy boundary.

Bx2—35 to 50 inches, yellowish-brown (10YR 5/6) light silty clay loam; many, medium, distinct, light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/6) mottles; weak, very coarse, prismatic structure parting to moderate, medium, blocky; firm and brittle, slightly sticky and plastic; common, thin clay films and few, black coatings on ped faces; neutral; gradual, wavy boundary.

C—50 to 61 inches, brown (10YR 4/3) silty clay; common, medium, distinct, yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) mottles; moderate, medium, blocky structure; firm, sticky and plastic; 5 percent coarse fragments; neutral.

The solum ranges from 40 to 60 inches in thickness, and bedrock is at a depth of 3½ to 6 feet or more. The soil ranges from medium acid to neutral throughout. The Ap horizon ranges from grayish brown to brown. The B2t, Bx1, and Bx2 horizons range from silt loam to silty clay loam. The C horizon ranges from silt loam to clay and in some places contains large amounts of shale.

Penlaw soils are associated on the landscape with the moderately well drained Clarksburg soils and the well drained Hagerstown and Duffield soils on uplands. The very poorly drained to poorly drained Dunning and Warners soils are on nearby flood plains. Penlaw soils are wetter than the Clarksburg soils; they are not so well drained as the Hagerstown and Duffield soils; and they are better drained than the Dunning and Warners soils.

Penlaw silt loam (Pe).—This soil is nearly level. Runoff is medium. Included in mapping were small areas of moderately well drained Clarksburg soils.

This Penlaw soil is suited to pasture, hay, and crops tolerant of wetness. Artificial drainage increases suitability for crops. The seasonal high water table, sinkholes, and slow permeability are limitations for most uses. Capability unit IIIw-2.

Philo Series

The Philo series consists of deep, nearly level, moderately well drained, medium-textured soils on flood plains. These soils formed in recent stream deposits washed from uplands underlain by sandstone and shale.

In a representative profile in an undisturbed area, the surface layer is dark grayish-brown silt loam about 3 inches thick. The next layer is 6 inches of dark-brown, friable silt loam. The subsoil extends to a depth of 29 inches and is yellowish-brown, friable silt loam that has strong-brown and grayish-brown mottles at a depth of 17 inches. The substratum is dark grayish-brown, friable fine sandy loam mottled with strong brown and grayish brown to a depth of 48 inches and dark grayish-brown gravelly sandy loam to a depth of 55 inches.

Philo soils are moderately permeable to moderately slowly permeable and high in available moisture capacity. A seasonal high water table rises to within 1½ to 3 feet of the surface during wet seasons. Flooding and the seasonal high water table are the main limitations. Most of the acreage has been cleared and is used for crops. A few areas are idle or used for trees, pasture, or hay.

Representative profile of Philo silt loam in an undisturbed area 2 miles southeast of Mercersburg along Conococheague Creek:

A11—0 to 3 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; loose, nonsticky and nonplastic; slightly acid; clear, smooth boundary.

A12—3 to 9 inches, dark-brown (10YR 4/3) silt loam; weak, medium, granular structure; friable, nonsticky and nonplastic; slightly acid; clear, wavy boundary.

B1—9 to 17 inches, yellowish-brown (10YR 5/6) silt loam; moderate, medium, granular structure; friable, slightly sticky and slightly plastic; medium acid; clear, wavy boundary.

B2—17 to 29 inches, yellowish-brown (10YR 5/4) silt loam; common, medium, distinct, strong-brown (7.5YR 5/8) and grayish-brown (10YR 5/2) mottles; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; medium acid; gradual, wavy boundary.

IIC1—29 to 48 inches, dark grayish-brown (10YR 4/2) fine sandy loam; common, coarse, prominent, strong-brown (7.5YR 5/8) and grayish-brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; friable, nonsticky and nonplastic; strongly acid; gradual, wavy boundary.

IIIC2—48 to 55 inches, dark grayish-brown (10YR 4/2) gravelly sandy loam; massive; friable, nonsticky and nonplastic; 20 percent coarse fragments; strongly acid.

The solum ranges from 20 to 40 inches in thickness. The Ap horizon ranges from very dark grayish brown to brown. The B1 and B2 horizons range from silt loam to sandy loam. The IIC1 and IIIC2 horizons range from 0 to 35 percent coarse fragments.

Philo soils are associated on the landscape with the deep, well-drained Pope soils and the deep, poorly drained Atkins soils on flood plains. The deep, well drained Allegheny soils; the deep, moderately well drained Monongahela soils; the deep, somewhat poorly drained Tyler soils; and the deep, poorly drained to very poorly drained Purdy soils are on nearby terraces. Philo soils are not so well drained as the Pope and Allegheny soils; they do not have the Bx horizon that is characteristic of the Monongahela soils; and they are better drained than the Atkins, Tyler, and Purdy soils.

Philo silt loam (Ph).—This soil is nearly level. Included in mapping were a few small areas of Atkins soils and a few areas of somewhat poorly drained soils. Also included were a few areas where the surface layer is gravelly sandy loam.

This soil is suited to crops somewhat tolerant of wetness and to trees and wildlife habitat. Where outlets are available, artificial drainage increases suitability for crops. The hazard of flooding and the seasonal high water table are limitations for most uses. Capability unit IIw-1.

Pope Series

The Pope series consists of deep, nearly level, well-drained, medium-textured and moderately coarse textured soils on flood plains. These soils formed in stream deposits washed from uplands underlain by sandstone, siltstone, and shale.

In a representative profile in an undisturbed area, the surface layer is dark-gray and dark-brown silt loam about 10 inches thick. The subsoil is dark-brown, very friable loam that extends to a depth of 31 inches. The substratum to a depth of 66 inches is dark-brown sandy loam.

Pope soils are moderately rapidly permeable and high in available moisture capacity. Flooding is a limitation for most uses. Most of the acreage has been cleared and is used for crops, pasture, or hay. A few areas are idle or wooded.

Representative profile of Pope silt loam in an undisturbed area of Pope soils 1¼ miles west of Orrstown along Conodoguinet Creek:

A11—0 to 2 inches, dark-gray (10YR 4/1) silt loam; weak, fine, granular structure; very friable, nonsticky and nonplastic; slightly acid; clear, wavy boundary.
A12—2 to 10 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable, nonsticky and nonplastic; strongly acid; clear, smooth boundary.
B2—10 to 31 inches, dark-brown (7.5YR 4/4) loam; weak, fine, granular structure; very friable, slightly sticky and nonplastic; 5 percent coarse fragments; strongly acid; gradual, wavy boundary.
C1—31 to 52 inches, dark-brown (10YR 4/3) sandy loam; massive; very friable, nonsticky and nonplastic; 5 percent coarse fragments; very strongly acid; gradual, wavy boundary.
C2—52 to 66 inches, dark-brown (10YR 4/3) sandy loam; massive; very friable, nonsticky and nonplastic; 5 percent coarse fragments; very strongly acid.

The solum ranges from 30 to 45 inches in thickness. The A11 and A12 horizons are silt loam, loam, and sandy loam. The B2 horizon ranges from dark brown to reddish yellow and from loam to sandy loam. The C horizon ranges from loam to gravelly loamy sand.

Pope soils are associated on the landscape with the deep, moderately well drained Philo soils and the deep, poorly drained Atkins soils on flood plains. The deep, well drained Allegheny soils and the deep, moderately well drained Monongahela soils are on nearby terraces. Pope soils do not have the Bt horizon that is characteristic of the Allegheny soils, and they are better drained than the Philo, Atkins, and Monongahela soils.

Pope soils (Po).—These soils are nearly level. They have profiles similar to the one described as representative of the series, but the surface layer ranges from silt loam to sandy loam.

Included with these soils in mapping were a few areas where the surface layer is gravelly and a few areas of Philo soils.

These Pope soils are suited to most crops commonly grown in the county and to trees and wildlife habitat. The hazard of flooding is the main limitation for most uses. Capability unit I-1.

Purdy Series

The Purdy series consists of deep, nearly level, poorly drained to very poorly drained, moderately fine textured soils on terraces or flats or in depressions. These soils formed in old, clayey stream deposits washed from uplands underlain by sandstone and shale.

In a representative profile in an undisturbed area, the surface layer is black and grayish-brown silty clay loam, is about 7 inches thick, and has a 1-inch covering of matted roots and decayed leaves. The subsoil extends to a depth of 40 inches. It is grayish-brown, firm and very firm silty clay loam and silty clay mottled with white, brownish yellow, and yellowish brown. The substratum to a depth of 66 inches is light brownish-gray silty clay loam and silty clay.

Purdy soils are slowly permeable and high in available moisture capacity. A high water table is at or near the surface much of the year. Slow permeability and the high water table are the main limitations. Most of the acreage has been cleared and is used for hay or pasture. A few areas are wooded or used for crops.

Representative profile of Purdy silty clay loam in a pasture 1½ miles south of Fannettsburg near Conococheague Creek:

O2—1 inch to 0, matted roots and decayed leaves.
A11—0 to 2 inches, black (10YR 2/1) silty clay loam; weak, medium, granular structure; friable, nonsticky and nonplastic; strongly acid; clear, wavy boundary.
A12—2 to 7 inches, grayish-brown (2.5Y 5/2) silty clay loam; few, fine, faint, light brownish-gray (10YR 6/2) and light-gray (10YR 7/2) mottles; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; very strongly acid; clear, wavy boundary.
B21tg—7 to 10 inches, grayish-brown (10YR 5/2) silty clay loam; common, medium, distinct, white (10YR 8/2), brownish-yellow (10YR 6/8), and yellowish-brown (10YR 5/6) mottles; moderate, medium, blocky structure; firm, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; very strongly acid; clear, wavy boundary.
B22tg—10 to 28 inches, grayish-brown (10YR 5/2) silty clay; common, medium, distinct, white (10YR 8/2) and brownish-yellow (10YR 6/8) mottles; strong, medium, blocky structure; firm, sticky and plastic; few, thin, patchy clay films on ped faces; very strongly acid; clear, wavy boundary.
B23tg—28 to 40 inches, grayish-brown (10YR 5/2) silty clay; few, fine, distinct, white (10YR 8/2) and brownish-yellow (10YR 6/8) mottles; strong, medium, blocky structure; very firm, sticky and plastic; few, thin, patchy clay films on ped faces; very strongly acid; clear, wavy boundary.
C1g—40 to 60 inches, light brownish-gray (10YR 6/2) silty clay loam; few, fine, distinct, light yellowish-brown (10YR 6/4) and dark-brown (7.5YR 4/4) mottles; weak, fine, granular structure; firm, slightly sticky and slightly plastic; 5 percent coarse fragments; very strongly acid; clear, irregular boundary.
C2—60 to 66 inches, light brownish-gray (10YR 6/2) silty clay; few, fine, faint, grayish-brown (10YR 5/2), white (10YR 8/2), and yellowish-brown (10YR 5/6) mottles; strong, medium, blocky structure; firm, slightly sticky and slightly plastic; 10 percent coarse fragments; very strongly acid.

The solum ranges from 30 to 48 inches in thickness. The B horizon ranges from dark gray to grayish brown and from clay to clay loam. The B and C horizons range from strongly acid to very strongly acid. The C horizon ranges from greenish gray to light brownish gray and from clay loam to clay.

Purdy soils are associated on the landscape with the deep, well drained Allegheny soils; the deep, moderately well drained Monongahela soils; and the deep, somewhat poorly drained Tyler soils. They have a more clayey B horizon than those soils.

Purdy silty clay loam (Pu).—This soil is nearly level. Runoff is slow.

Included with this soil in mapping were some areas where the subsoil is gravelly or cobbly sandy clay loam.

Also included were a few areas where the subsoil and substratum are mildly alkaline and moderately alkaline.

Unless this soil is drained, it is too wet for most crops. Artificial drainage increases suitability for crops. This soil can be used for pasture and hay if it is carefully managed. The high water table and slow permeability are the main limitations for most uses. Capability unit IVw-1.

Ryder Series

The Ryder series consists of moderately deep, gently sloping to moderately steep, well-drained, medium-textured soils on dissected uplands. These soils formed in material weathered from thin bedded limestone.

In a representative profile in a cultivated area, the plow layer is dark-brown silt loam about 8 inches thick. The subsoil extends to a depth of 30 inches. It is yellowish-brown, friable silt loam to a depth of 16 inches and yellowish-brown, firm channery silt loam in the lower part. The substratum is 6 inches of yellowish-brown, very channery silt loam. Limestone bedrock is at a depth of about 36 inches.

Ryder soils are moderately permeable to moderately rapidly permeable and moderate to high in available moisture capacity. Shallowness over bedrock is the main limitation. Nearly all the acreage has been cleared and is used for crops, and a few areas are used for fruit trees.

Representative profile of Ryder silt loam, 3 to 8 percent slopes, in a pasture 2 miles southeast of Waynesboro:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; weak, medium, granular structure; friable, slightly sticky and slightly plastic; 5 percent coarse fragments; slightly acid; abrupt, smooth boundary.

B1—8 to 16 inches, yellowish-brown (10YR 5/8) silt loam; moderate, medium, blocky structure; friable, slightly sticky and slightly plastic; few, thin silt coats on ped faces; 5 percent coarse fragments; slightly acid; gradual, wavy boundary.

B21t—16 to 24 inches, yellowish-brown (10YR 5/8) channery silt loam; moderate, medium, blocky structure; firm, slightly sticky and slightly plastic; few, thin, discontinuous clay films on ped faces; 15 percent coarse fragments; slightly acid; gradual, wavy boundary.

B22t—24 to 30 inches, yellowish-brown (10YR 5/6) channery silt loam; moderate, medium, blocky structure; firm, slightly sticky and slightly plastic; few, thin, discontinuous clay films on ped faces; 15 percent coarse fragments; slightly acid; gradual, wavy boundary.

C—30 to 36 inches, yellowish-brown (10YR 5/4) very channery silt loam; massive; friable, slightly sticky and slightly plastic; few, thin, patchy clay films on coarse fragments; 75 percent coarse fragments; slightly acid; abrupt, wavy boundary.

R—36 inches, limestone bedrock.

The solum ranges from 20 to 36 inches in thickness, and bedrock is at a depth of 2 to 3½ feet. The Ap horizon ranges from very dark grayish brown to brown and is less than 15 percent coarse fragments. The B1, B21t, and B22t horizons range from brown to yellowish brown or light olive brown and are channery loam, silt loam, and silty clay loam in texture. The C horizon ranges from loam to silt loam in texture and is 30 to 90 percent coarse fragments.

Ryder soils are associated on the landscape with the deep, well-drained Duffield and Hagerstown soils. They are not so deep over bedrock as those soils.

Ryder silt loam, 3 to 8 percent slopes (RyB).—This soil has the profile described as representative of the series. Runoff is medium.

Included with this soil in mapping were a few small areas of Duffield soils and a few areas where bedrock is at a depth of less than 24 inches. Also included, in Little Cove Valley and Horse Valley, were a few areas of soils that are reddish channery silt loam.

This Ryder soil is suited to most crops commonly grown in the county and to trees and wildlife habitat. Shallowness over bedrock is the main limitation. Capability unit IIe-1.

Ryder silt loam, 8 to 15 percent slopes (RyC).—This soil has a profile similar to the one described as representative of the series, but it is slightly shallower over bedrock and the surface layer is about 2 inches thinner. Runoff is medium.

Included with this soil in mapping were a few areas of Duffield soils and a few areas where the surface layer is channery silt loam. Also included, in Little Cove Valley and Horse Valley, were small areas of soils that are reddish channery silt loam.

This Ryder soil is suited to most crops commonly grown in the county and to trees and wildlife habitat. Slope and shallowness over bedrock are the main limitations. Capability unit IIIe-1.

Ryder silt loam, 15 to 25 percent slopes (RyD).—This soil has a profile similar to the one described as representative of the series, but it is a few inches shallower over bedrock. Runoff is rapid.

Included with this soil in mapping were a few areas of limestone outcrop and a few areas where bedrock is at a depth of less than 24 inches. Also included, in Little Cove Valley and Horse Valley, were a few areas of soils that are reddish channery silt loam.

This Ryder soil is better suited to crops that require limited tillage and to trees and wildlife habitat than to other uses. Slope and shallowness over bedrock are the main limitations. Capability unit IVe-1.

Tyler Series

The Tyler series consists of deep, nearly level, somewhat poorly drained, medium-textured soils on terraces. These soils formed in loamy stream deposits washed from uplands underlain by acid sandstone and shale.

In a representative profile in a cultivated area, the surface layer is grayish-brown silt loam about 8 inches thick. The subsoil extends to a depth of 50 inches. The upper 22 inches is brown, firm silt loam and silty clay loam mottled in the lower part with gray; and the lower part is pale-brown, firm and brittle silty clay loam and clay loam mottled with gray, yellowish brown, and strong brown. The substratum to a depth of 65 inches is yellowish-brown loam.

Tyler soils are slowly permeable and moderate in available moisture capacity. A seasonal water table rises to within ½ foot to 1½ feet of the surface during wet seasons. The seasonal high water table and slow permeability are limitations for many uses. Most of the acreage has been cleared and is used for pasture, hay, or crops.

Representative profile of Tyler silt loam in a cultivated

field 2 miles northeast of Pleasant Hill between Routes T633 and Pa. 333:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; weak, fine, granular structure; friable, slightly sticky and nonplastic; slightly acid; abrupt, smooth boundary.
B21t—8 to 14 inches, brown (10YR 5/3) silt loam; weak, fine, subangular blocky structure; firm, slightly sticky and slightly plastic; few, thin, patchy clay films on ped faces; few pebbles; slightly acid; abrupt, wavy boundary.
B22t—14 to 30 inches, brown (10YR 5/3) silty clay loam; common, medium, distinct, gray (10YR 6/1) mottles; moderate, medium, subangular blocky structure; firm, slightly sticky and plastic; common, thin, discontinuous clay films on ped faces; medium acid; gradual, smooth boundary.
Bx1—30 to 40 inches, pale-brown (10YR 6/3) silty clay loam; many, distinct, strong-brown (7.5YR 5/8) and gray (10YR 6/1) mottles; moderate, medium, prismatic structure parting to weak, thin, platy; firm and brittle, slightly sticky and plastic; common, thin, discontinuous clay films on ped faces; medium acid; gradual, smooth boundary.
IIBx2—40 to 50 inches, pale-brown (10YR 6/3) clay loam; many, coarse, distinct, yellowish-brown (10YR 5/8) and gray (10YR 6/1) mottles; weak, medium, prismatic structure parting to weak, thin, platy; firm and brittle, slightly sticky and plastic; few, thin, discontinuous clay films on ped surfaces; strongly acid; gradual, smooth boundary.
IIC—50 to 65 inches, yellowish-brown (10YR 5/8) loam; many, coarse, distinct, gray (10YR 6/1) mottles; massive; firm, slightly sticky and slightly plastic; strongly acid.

The solum ranges from 40 to 70 inches in thickness. The Ap horizon ranges from dark grayish brown to brown. The B21t horizon ranges from brown to yellowish brown and from silt loam to silty clay loam. The Bx horizon is at a depth of 15 to 34 inches. It ranges from gray to brown in color and from silt loam to clay loam. The C horizon ranges from yellowish brown to gray.

The Tyler soils in Franklin County do not have low-chroma mottles in the B21t horizon, have a thinner Bx horizon, and are slightly deeper over the Bx horizon than defined for the series. These differences do not alter the usefulness or behavior of the soils.

Tyler soils are associated on the landscape with the deep, well drained Allegheny soils; the deep, moderately well drained Monongahela soils; and the deep, poorly drained to very poorly drained Purdy soils on terraces. They are not so well drained as the Allegheny soils; they are wetter than the Monongahela soils; and they are better drained than the Purdy soils.

Tyler silt loam (Ty).—This soil is nearly level. Runoff is medium. Included in mapping were a few areas of poorly drained soils and a few areas where the surface layer is silty clay loam.

This soil is suited to crops tolerant of wetness and to trees and wildlife habitat. Artificial drainage increases suitability for crops. The seasonal high water table and slow permeability are limitations for most uses. Capability unit IIIw-2.

Urban Land

Urban land (Ur) consists of nearly level to sloping land that is so altered or obscured by urban development that identification of soils is not feasible. Most areas are on uplands; a few areas are on flood plains and terraces.

Included with this unit in mapping were a few areas that had not been obscured by urban works and a few areas that had been cut and filled with earthy and trashy material.

Urban land is mainly used for shopping centers, schools, factories, roads, railroads, and other urban and industrial facilities. Onsite investigation is needed to determine hazards, limitations, and suitability for use of individual areas. Capability unit not assigned.

Vanderlip Series

The Vanderlip series consists of deep, nearly level to very steep, well-drained, coarse-textured soils on uplands. These soils formed in material weathered from slightly calcareous sandstone.

In a representative profile in a wooded area, the surface layer is dark grayish-brown cobbly loamy sand, is about 4 inches thick, and has a 2-inch covering of leaves and partly decayed leaves and twigs. The next layer is about 20 inches of light yellowish-brown and brownish-yellow, loose cobbly loamy sand. The subsoil extends to a depth of 46 inches. It is brownish-yellow, very friable loamy sand that has thin, dark-brown bands. The substratum to a depth of 65 inches is yellow, loose sand.

Vanderlip soils are rapidly permeable and low in available moisture capacity. The capacity for storage of plant nutrients is low. The cobbly surface layer and rapid permeability are the main limitations. Most of the acreage is wooded. A few areas have been cleared and are used for pasture or hay, and a few have been used as a source of sand.

Representative profile of Vanderlip cobbly loamy sand, 0 to 25 percent slopes, in a woodlot 2 miles south of Mainsville:

O1—2 inches to 1 inch, hardwood leaves.
O2—1 inch to 0, partly decayed leaves and twigs.
A1—0 to 4 inches, dark grayish-brown (10YR 4/2) cobbly loamy sand; weak, very fine, granular structure; loose, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; clear, wavy boundary.
A21—4 to 10 inches, light yellowish-brown (10YR 6/4) cobbly loamy sand; weak, fine, granular structure; loose, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; clear, wavy boundary.
A22—10 to 24 inches, brownish-yellow (10YR 6/6) cobbly loamy sand; single grained; loose, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; gradual, wavy boundary.
A&B—24 to 46 inches, brownish-yellow (10YR 6/6) loamy sand matrix that has about 5 inches of dark-brown (10YR 4/3) bands ⅛ to ¼ inch thick; single grained matrix and massive bands; very friable, nonsticky and nonplastic; common bridges of clay across sand grains in bands; 10 percent coarse fragments; strongly acid; gradual, wavy boundary.
C—46 to 65 inches, yellow (2.5Y 7/6) sand; single grained; loose, nonsticky and nonplastic; occasional coarse fragments; strongly acid.

The solum ranges from 40 to 72 inches in thickness, and bedrock is at a depth of 3½ to 20 feet or more. The soil ranges from very strongly acid to medium acid throughout. The Ap horizon ranges from brownish yellow to dark yellowish brown. The A21 and A22 horizons range from brown to brownish yellow and are 0 to 20 percent coarse fragments. The A&B horizon has a matrix color that ranges from brown to olive yellow, lamellae that range from dark brown to strong brown, and texture that ranges from loamy sand to sand.

The Vanderlip soils in Franklin County have an aggregate thickness of bands thinner than is defined for the series. This difference does not alter the usefulness or behavior of the soils.

Vanderlip soils are associated on the landscape with the moderately deep, well-drained Dekalb soils; the moderately deep, well-drained to excessively drained Leetonia soils; and the deep, well-drained Edgemont and Laidig soils. Vanderlip soils have fewer coarse fragments in the B horizon than Edgemont soils; they do not have the Bx horizon that is characteristic of the Laidig soils; and they are deeper over bedrock than the Dekalb and Leetonia soils.

Vanderlip cobbly loamy sand, 0 to 25 percent slopes (VaD).—This soil has the profile described as representative of the series. Runoff is slow. Included in mapping were a few stony soils and a few areas where the surface layer is gravelly.

This soil is better suited to trees and wildlife habitat than to other uses. Cobblestones, rapid permeability, and slope are limitations for many uses. Capability unit VIIs-1.

Vanderlip cobbly loamy sand, 25 to 50 percent slopes (VaE).—This soil has a profile similar to the one described as representative of the series, but it has a few more coarse fragments in the substratum. Runoff is slow. Included in mapping were a few areas of stony soils.

This soil is better suited to trees and wildlife habitat than to other uses. Cobblestones, rapid permeability, and slope are limitations for most uses. Capability unit VIIs-3.

Very Stony Land, Dekalb Soil Material

Very stony land, Dekalb soil material (Vd) consists of gently sloping to very steep, stony and bouldery soils on the tops and sides of mountains. About 15 to 90 percent of the surface area is covered with stones and boulders of conglomerate, quartzite, and sandstone. Included in mapping were a few areas where more than 90 percent of the surface area is covered with stones.

Very stony land, Dekalb soil material supports a wide variety of trees. The quality of trees is good, but yields are low. The stones and boulders make revegetation difficult. This land is better suited to trees and wildlife habitat than to other uses. It can be used as a source of stone. Stoniness and slope are the main limitations for most uses. Capability unit VIIIs-1.

Warners Series

The Warners series consists of deep, nearly level, very poorly drained, medium-textured soils on flood plains where there is seepage of water charged with calcium carbonate. These soils formed in stream deposits high in content of marl or calcium carbonate.

In a representative profile in a cultivated area, the plow layer is very dark brown silt loam about 12 inches thick. The next layer extends to a depth of 38 inches. It is grayish-brown and gray, friable silt loam that has light-gray and light brownish-gray specks, patches, and streaks of marl. The substratum to a depth of 74 inches is light-gray marl.

Warners soils are slowly permeable and high in available moisture capacity. A water table is at or near the surface most of the year. Flooding, the high water table, and slow permeability are limitations for most uses. Most of the acreage has been cleared and is used for pasture or hay. A few areas are idle or used for crops.

Representative profile of Warners silt loam in a cultivated field 2 miles southwest of Greencastle; profile S65-Pa-28-2(1-4) in tables 12 and 13:

Ap—0 to 12 inches, very dark brown (10YR 2/2) silt loam that has few, fine, faint, white (10YR 8/1) specks of marl; weak, fine, granular structure; friable, nonsticky and nonplastic; mildly alkaline; abrupt, wavy boundary.

C1—12 to 23 inches, grayish-brown (10YR 5/2) silt loam that has common, fine, distinct, light-gray (2.5Y 7/2) specks of marl; massive parting to weak, fine, granular structure; friable, nonsticky and nonplastic; mildly alkaline; calcareous; abrupt, smooth boundary.

C2—23 to 38 inches, gray (10YR 5/1) silt loam that has few, fine, faint, light brownish-gray (10YR 6/2) patches and streaks of marl; massive parting to weak, medium, granular structure; friable, nonsticky and nonplastic; moderately alkaline; abrupt, wavy boundary.

IIC3—38 to 74 inches, light-gray (10YR 7/1) marl; moderately alkaline.

The Ap horizon ranges from very dark brown to black in color and from 6 to 12 inches in thickness. The C1 and C2 horizons range from very dark gray to grayish brown and from silt loam to silty clay loam.

The Warners soils are associated on the landscape with the deep, moderately well drained to somewhat poorly drained Dunning overwash variant soils; the deep, poorly drained Atkins and Melvin soils; and the deep, very poorly drained to poorly drained Dunning soils on flood plains. Warners soils contain marl that is absent from all those soils.

Warners silt loam (Wa).—This soil is nearly level. Runoff is slow.

Included with this soil in mapping were a few areas of Dunning soils and a few areas where the surface layer is silty clay loam.

This Warners soil is better suited to crops tolerant of wetness and to hay, pasture, trees, and wildlife habitat than to other uses. Artificial drainage increases suitability for crops. The hazard of flooding, slow permeability, and the high water table are limitations for many uses. Capability unit IIIw-1.

Weikert Series

The Weikert series consists of shallow, nearly level to very steep, well-drained, medium-textured soils on dissected uplands. These soils formed in material weathered from interbedded gray and brown acid shale, siltstone, and sandstone.

In a representative profile in a cultivated area, the plow layer is dark-brown shaly silt loam about 7 inches thick. The subsoil is yellowish-brown, friable very shaly silt loam that extends to a depth of 14 inches. The substratum is 4 inches of yellowish-brown very shaly silt loam. Shale bedrock is at a depth of about 18 inches.

Weikert soils are moderately rapidly permeable and low to very low in available moisture capacity. Depth to

bedrock, coarse fragments, and slope are limitations for many uses. Much of the acreage has been cleared and is used for crops, hay, and pasture. Some areas are wooded.

Representative profile of Weikert shaly silt loam, 2 to 8 percent slopes, in a cultivated field 3 miles west of Chambersburg:

Ap—0 to 7 inches, dark-brown (10YR 4/3) shaly silt loam; weak, fine, granular structure; friable, nonsticky and slightly plastic; 30 percent coarse fragments; strongly acid; clear, smooth boundary.

B2—7 to 14 inches, yellowish-brown (10YR 5/4) very shaly silt loam; weak, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; few, patchy clay and silt films on coarse fragments; 50 percent coarse fragments; strongly acid; gradual, wavy boundary.

C—14 to 18 inches, yellowish-brown (10YR 5/4) very shaly silt loam; massive; friable, slightly sticky and slightly plastic; common, patchy silt and clay films on coarse fragments; 70 percent coarse fragments; very strongly acid; clear, wavy boundary.

R—18 inches, dark-gray (5Y 4/1) shale bedrock.

The solum ranges from 8 to 20 inches in thickness, and bedrock is at a depth of 1 foot to 1½ feet. The Ap horizon ranges from dark brown to yellowish brown and is 20 to 50 percent coarse fragments. The B2 horizon ranges from shaly loam to very shaly silt loam. The C horizon is 60 to 85 percent coarse fragments.

Weikert soils are associated on the landscape with the deep, well drained Bedington soils; the moderately deep, well drained Berks soils; the moderately deep, somewhat poorly drained to moderately well drained Blairton soils; and the deep, poorly drained Brinkerton soils. They are not so deep over bedrock as those soils.

Weikert shaly silt loam, 2 to 8 percent slopes (WeB).—This soil has the profile described as representative of the series. Runoff is rapid.

Included with this soil in mapping were a few soils that have a very shaly surface layer, a few that are reddish shaly silt loam, and a few that are more than 85 percent coarse fragments in the substratum. Also included, in the area of South Mountain, were a few soils that contain coarse fragments of metamorphosed shale.

This Weikert soil is suited to some crops commonly grown in the county and to trees and wildlife habitat. Coarse fragments and depth to bedrock are limitations for most uses. Capability unit IIIe-6.

Weikert shaly silt loam, 8 to 15 percent slopes (WeC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is about 2 inches thinner and contains a few more coarse fragments. Runoff is rapid.

Included with this soil in mapping were a few soils that have a very shaly surface layer, a few that are reddish shaly silt loam, and a few that are more than 85 percent coarse fragments in the substratum. Also included, in the area of South Mountain, were a few soils that contain coarse fragments of metamorphosed shale.

This Weikert soil is suited to some crops commonly grown in the county and to trees and wildlife habitat. Depth to bedrock, slope, and coarse fragments are the main limitations. Capability unit IVe-2.

Weikert shaly silt loam, 15 to 25 percent slopes (WeD).—This soil has a profile similar to the one described as representative of the series, but it is a few inches shallower over bedrock. Runoff is rapid.

Included with this soil in mapping were a few soils that have a very shaly surface layer, a few areas of reddish soils that have a surface layer and subsoil of shaly silt loam, and a few soils that are more than 85 percent coarse fragments in the substratum. Also included, in the area of South Mountain, were a few soils that contain coarse fragments of metamorphosed shale.

This Weikert soil is better suited to hay, pasture, trees, and wildlife habitat than to other uses. Depth to bedrock, slope, and coarse fragments are the main limitations. Capability unit VIe-1.

Weikert shaly silt loam, 25 to 70 percent slopes (WeF).—This soil has a profile similar to the one described as representative of the series, but it is a few inches shallower over bedrock. Runoff is very rapid.

Included with this soil in mapping were a few areas of Berks and Bedington soils and a few soils that are more than 50 percent coarse fragments in the surface layer.

This Weikert soil is better suited to pasture, trees, and wildlife habitat than to other uses. Slope, depth of bedrock, and coarse fragments are the main limitations. Capability unit VIIe-1.

Weikert very shaly silt loam, 3 to 8 percent slopes, eroded (WkB3).—This soil has a profile similar to the one described as representative of the series, but the surface layer is very shaly. Runoff is rapid.

Included with this soil in mapping were a few areas of Berks soils, a few soils that have a shaly surface layer, and a few soils that are more than 85 percent coarse fragments in the substratum.

This Weikert soil is suited to pasture, hay, trees, and wildlife habitat. Coarse fragments and depth to bedrock are limitations for most uses. Capability unit IVe-2.

Weikert very shaly silt loam, 8 to 15 percent slopes, eroded (WkC3).—This soil has a profile similar to the one described as representative of the series, but the surface layer is very shaly. Runoff is rapid.

Included with this soil in mapping were a few soils that have a shaly surface layer, a few areas of Berks soils, and a few soils that are more than 85 percent coarse fragments in the substratum.

This Weikert soil is suited to hay, pasture, trees, and wildlife habitat. Coarse fragments, depth to bedrock, and slope are limitations for many uses. Capability unit VIe-1.

Weikert very shaly silt loam, 15 to 25 percent slopes, eroded (WkD3).—This soil has a profile similar to the one described as representative of the series, but the surface layer is very shaly and it is a few inches shallower over bedrock. Runoff is very rapid.

Included with this soil in mapping were a few soils that are less than 10 inches deep over bedrock, a few soils that have a shaly surface layer, and a few soils that are more than 85 percent coarse fragments in the substratum.

This soil is suited to pasture, trees, and wildlife habitat. Slope, depth to bedrock, and coarse fragments are limitations for most uses. Capability unit VIIe-1.

Formation and Classification of the Soils

This section describes the formation, morphology, and classification of the soils in Franklin County. The first part explains the factors of soil formation; the second part explains the processes of soil formation; the third part explains nomenclature; and the last part explains the soil classification system and classifies the soils of the county.

Factors of Soil Formation

Soils are complex mixtures of weathered rocks, minerals, organic matter, water, and air that occur in varying proportions. They formed through the chemical and physical weathering of geologic materials. The extent of the weathering and the characteristics of any soil that develops depend on the nature of the parent rock; the kind of climate; the relief, or lay of the land; the plant and animal life in and on the soil; and the length of time these factors have affected development.

In a small area such as Franklin County where vegetation, time, and climate vary only slightly, the nature of the parent rock produces more differences in texture and mineral content than most of the other soil-forming factors. Climate influences the nature and extent of the weathering processes. Relief affects drainage, aeration, runoff, erosion, and exposure to sun and wind. Plant and animal life influence soil characteristics by both physical and chemical removals and additions. Finally, time is required for the other soil-forming factors to exert their influence. Long periods of time are necessary for changes in soils to become apparent. Nevertheless, soils are slowly but constantly changing.

Parent material

The soils of Franklin County formed mainly in material weathered from shale, siltstone, sandstone, quartzite, metarhyolite, and limestone. Duffield and Hagerstown soils formed in material weathered from limestone, and Weikert, Berks, and Bedington soils in material weathered from acid sandstone, siltstone, and shale.

Dekalb, Edgemont, and Highfield soils formed in material weathered from acid sandstone, quartzite, conglomerate, and metarhyolite. The Dekalb soils, derived from coarse-grained sandstone, have a high content of sand. The reddish Lehew soils formed in material weathered from red shale and sandstone. Allegheny, Philo, Atkins, Melvin, and Pope soils formed in sediments deposited on terraces and flood plains of streams.

Climate

The climate of this county is the humid-temperate, continental type of climate characteristic of the Middle Atlantic States. Some characteristics of the soil profiles indicate that this kind of climate prevailed when the soils were forming, and that it influenced soil development. Many of the soils are acid and strongly leached.

The effect of climate on the formation of soils has been nearly uniform throughout the county. The formation of some soils, however, may have been influenced by a microclimate caused by differences in relief.

Relief

Relief depends to a large extent on the nature of the underlying rock. The highest ridges in the landscape, such as those occupied by the Dekalb and Leetonia soils, occur where the rocks are most resistant to weathering. Relief affects runoff, and runoff, in turn, affects the soils over which it flows. Water from runoff also enters streams that play a part in causing erosion and in dissecting areas of soils. Furthermore, in areas of sloping or hilly relief, runoff and gravity cause soil material to wash or fall from the side slopes and to accumulate at the base of the slopes. Accumulated material at the base of slopes is an important part of the material in which the Laidig, Brinkerton, and Buchanan soils formed.

Plant and animal life

Hardwood trees have apparently had more effect on the formation of the soils of Franklin County than other kinds of plants. Forests of hardwoods originally covered most of the county. The trees were mainly of the oak-hickory type, but forests of sugar maple, beech, and yellow birch occupied less extensive areas. Hemlocks and pines also grew in small areas that were mostly cooler and wetter and at higher elevations than the rest of the county.

The soils are typical of those developed under forest. Where they have not been disturbed, a layer of leaf litter covers the surface and is underlain by a black O2 horizon 1 to 3 inches thick. The O2 horizon is commonly underlain by a dark-colored A1 horizon 1 to 2 inches thick. Beneath the A1 horizon is a light-colored A2 horizon several inches thick, similar to the one in the profile described as representative of the Leetonia series.

When the forests were cleared and the soils were farmed, the layers of organic matter were incorporated into the plow layer or were burned. Thus, in many places the soils were exposed to wind and rain that produced accelerated erosion.

The activities of man, for example, cultivation, liming, artificial drainage, manuring, and maintaining a cover of perennial grasses and legumes, have had a major effect on the soil.

Time

The length of time the other factors of soil formation have operated is indicated, to some extent, by the degree of profile formation. Some soils, especially those that formed in alluvium, have only a weakly defined profile because the soil material has not been in place long enough for distinct horizons to form. Examples of soils that formed in alluvium are the Philo, Atkins, Melvin, and Pope soils. These soils are continually receiving fresh material that is deposited on the surface. They are called young, or recent, soils.

The profile of the Weikert, Berks, and Lehew soils shows that some changes have taken place in the parent

material. These changes, however, do not represent the effects of advanced weathering. Weathering and the formation of horizons in those soils have been slowed by the effects of relief and by the kind of parent material.

The Bedington, Laidig, Ryder, and Duffield soils have a well-defined profile. The parent material has been in place long enough that distinct horizons have formed.

Processes of Soil Formation

As weathering proceeds and plants grow on a young soil, several processes in soil formation are apparent. For example, soils gain material when leaves and plant remains accumulate on the surface. This accumulation is easily seen in areas of Dekalb, Hazleton, and other soils that formed under forest and have not been plowed. Additions of organic matter, chemicals, and mineral material are also brought in from adjacent areas by animals, floodwaters, and wind; or they are transferred as a result of gravity.

Losses from the soils occur when minerals decompose and part of the products of weathering are leached from the soils in solution. This process is apparent in the Duffield and Hagerstown soils, from which calcium carbonate has been lost. Losses also occur when plant nutrients are removed in harvested plants. In addition, fine particles of soil material are removed by erosion, and gases escape as organic matter decomposes.

The transfer or translocation of material from one part of the soil to another is common in most soils. Organic matter is moved from the upper part of the profile to the lower part in suspension or solution. Calcium is leached from the surface layer and is held by the clay in the subsoil. The Duffield and Markes soils are examples of soils in which the results of this process are evident. Clay has accumulated in the B horizon as a result of transfer of clay from horizons higher in the profile.

Bases and plant nutrients are moved upward when they are absorbed by the roots of plants and rise in the stem to be stored in the leaves and twigs. When the plant dies and decays, the plant nutrients are returned to the soil.

Transformations occur as chemical weathering takes place. During the process of chemical weathering, iron, aluminum, calcium, and other elements are released from the primary and secondary minerals in the soil. The gray and white colors of the parent material of a well-drained Hagerstown soil, for example, gradually are replaced by the red, brown, and yellow colors of oxidized iron compounds as the parent material weathers. These changed colors indicate that iron has been released or that ferrous oxide has been oxidized to ferric oxide in the presence of an adequate supply of oxygen.

Nomenclature

This section contains a brief description of horizon nomenclature.

The O1 and O2 horizons are generally the first to form on the accumulated weathered parent material. The O2 horizon is the one in which the maximum amount of organic matter has accumulated.

The A horizon, or surface layer, is beneath the O2 horizon. Its formation parallels that of the O2 horizon. The A horizon is commonly divided into two layers, the A1 and the A2. The A1 horizon consists of mixed, dark-colored, organic and mineral soil material. The A2 horizon, just beneath the A1 horizon, becomes apparent after weathering and leaching, or eluviation, have removed the soluble substances from the lower part of the A horizon. If the A horizon has been mixed in plowing and if crop residue and manure have been incorporated, this layer is designated as an Ap horizon.

The B horizon, or subsoil, is below the A horizon. It generally has a higher content of clay and a lower content of organic matter than the A horizon. The B horizon forms after the A horizon has formed. It is often called the illuviated horizon, or the horizon that has retained some of the substances, such as clay, iron, aluminum, oxides, and organic colloids, which have moved out of the A horizon. The B horizon also contains many secondary minerals, mainly silicate clay derived from altered primary minerals. The B horizon is a result of both illuviation and transformation.

The B horizon has three main subdivisions—the B1, B2, and B3 horizons. The B1 horizon has weakly defined features of the B horizon. The B2 horizon generally contains the largest amount of clay of any of these horizons. Hagerstown soils, for example, have a high content of clay in the B2 horizon, as shown in the profile described as representative of the series. The B3 horizon has some properties of the B horizon and some of the C horizon. In most places it contains fewer altered primary minerals than the B2 horizon and a smaller accumulation of clay.

Together, the A and B horizons constitute the solum—the zone in which most of the organic and mineral matter has been added, removed, transferred, or translocated through soil-forming processes.

Below the solum is the C horizon, or substratum. The C horizon consists of relatively unweathered parent material or contrasting material. In some places it contains some of the material that has leached out of both the A and B horizons as a result of weathering. The C horizon consists mainly of partly weathered minerals and fragments of rock.

Below the C horizon, in some soils, is an R horizon of consolidated bedrock, such as limestone, sandstone, or conglomerate.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us understand their behavior and their response to manipulation. First through classification and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Thus, in classification, soils are placed in narrow categories that are used in detailed soil surveys so that

knowledge about the soils can be organized and used in managing farms, fields, and woodlots; in developing rural areas; in performing engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

The current system of soil classification defines soils in terms of observable or measurable properties. The system currently used and described in this section was adopted for general use by the National Cooperative Soil Survey in 1965. This system is under constant study; therefore, readers interested in the development of the system should search the latest literature available for the current revisions (*15, 19*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. Table 11 places the soil series in Franklin County in some categories of the system. Some of the classes of the system are briefly defined in the paragraphs that follow.

ORDER.—Ten soil orders are recognized. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate these soil orders are those that tend to give broad climatic groupings of soils. The two exceptions to this are the Entisols and Histosols, which occur in many different kinds of climate. The six orders represented in Franklin County are Entisols, Inceptisols, Mollisols, Spodosols, Alfisols, and Ultisols.

Entisols are the youngest soils in Franklin County. They show little evidence of horizon formation other than darkening of the A horizon. Atkins and Melvin soils are examples.

Inceptisols generally form on young, but not the youngest, land surfaces. Typically, they have a surface layer that has been darkened to a depth of a few inches by organic matter. The B horizon has uniform color, moderate to strong structure, and little if any accumulation of silicate clay. In Franklin County examples of Inceptisols are Berks, Dekalb, and Lehew soils.

Mollisols typically have a surface layer that has been darkened by organic matter to a depth of many inches. This order is represented in Franklin County by the Dunning and Warners soils.

Spodosols typically have a layer of iron and humus accumulation in the B horizon. Leetonia soils are the only Spodosols in Franklin County.

Alfisols have a distinct accumulation of silicate clay in the B horizon and have a base saturation of more than 35 percent. The base saturation increases with increasing depth. This order is represented in Franklin County by the Brinkerton, Duffield, and Hagerstown soils.

Ultisols have a clay-enriched B horizon that has less than 35 percent base saturation, and the base saturation decreases with increasing depth. This order is represented in Franklin County by the Bedington, Buchanan, and Murrill soils.

SUBORDER.—Each order is divided into suborders, based mostly on soil characteristics that seem to produce classes that have the greatest similarity from the standpoint of genesis. Suborders narrow the broad climatic range of the orders.

Soil characteristics used to separate suborders mainly reflect either the presence or absence of waterlogging or soil differences produced through the effects of climate or vegetation. The names of suborders contain two syllables, the last of which indicates the order.

GREAT GROUP.—Each suborder is divided into great groups on the basis of uniformity in kinds and sequences of major soil horizons and other features. The horizons used as a basis for distinguishing between great groups are those in which clay, iron, or humus has accumulated; pans that interfere with growth of roots, movement of water, or both have formed; or a thick, dark-colored surface horizon has developed. The other features commonly used are the self-mulching properties of clay, temperature of the soil, and major differences in chemical composition, mainly the bases calcium, magnesium, sodium, and potassium.

Names of the great groups consist of three or four syllables. A prefix is added to the name of the suborder. The great group is not shown separately in table 11, because it is the last word in the name of the subgroup.

SUBGROUP.—Each great group is divided into subgroups, one representing the central, or typic, concept of the group and others, called intergrades, made up of soils that have properties of the group but also have one or more properties of another great group. Subgroups also may be established for soils that have properties that intergrade outside the range of any other great group, by placing one or more adjectives ahead of the name of the great group. An example is Typic Fluvaquents.

FAMILY.—Families are established within a subgroup, primarily on the basis of properties that are important to the growth of plants or to the behavior of soils used for engineering. The main properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. The names of families consist of a series of adjectives that precede the name of a subgroup. An example is the fine-loamy, mixed, acid, mesic family of Typic Fluvaquents.

SERIES.—The soil series is a group of soils that, except for texture of the surface layer, are essentially similar in differentiating characteristics and in arrangement of horizons.

Laboratory Data [7]

Data on the physical and chemical properties and mineralogical properties of the clay fraction in Berks, Duffield, Dunning overwash variant, and Markes soils are given in tables 12, 13, and 14. Profiles were selected to most nearly represent the series in morphological characteristics, slope, erosion, and land use. The soil morphology was described at each site. The descriptions are those used to represent the series in the section "Descriptions of the Soils." Samples were collected and analyzed from each horizon described.

[7] Analysis and interpretations made at The Pennsylvania State University Soil Characterization Laboratory by R. P. MATELSKI, R. L. CUNNINGHAM, L. T. JOHNSON, R. W. RANNEY, and others.

TABLE 11.—*Classification of the soils*

Soil series	Family	Subgroup	Order
Allegheny	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Alluvial land	Too variable to classify at the family level.	Fluvaquents and Ochrepts	Entisols and Inceptisols.
Andover	Fine-loamy, mixed, mesic	Typic Fragiaquults	Ultisols.
Atkins	Fine-loamy, mixed, acid, mesic	Typic Fluvaquents	Entisols.
Atkins clayey subsoil variant.	Fine, mixed, acid, mesic	Typic Fluvaquents	Entisols.
Bedington	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Berks	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Blairton	Fine-loamy, mixed, mesic	Aquic Hapludults	Ultisols.
Brinkerton	Fine-silty, mixed, mesic	Typic Fragiaqualfs	Alfisols.
Buchanan	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols.
Clarksburg	Fine-loamy, mixed, mesic	Typic Fragiudalfs	Alfisols.
Dekalb	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Duffield	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Dunning [1]	Fine, mixed, mesic	Fluvaquentic Haplaquolls	Mollisols.
Dunning overwash variant.	Fine-loamy, mixed, mesic	Fluvaquentic Eutrochrepts	Inceptisols.
Edgemont [1]	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Edom	Fine, illitic, mesic	Typic Hapludalfs	Alfisols.
Edom moderately well drained variant.	Fine, illitic, mesic	Aquic Hapludalfs	Alfisols.
Glenville	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols.
Hagerstown	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Hazleton	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Highfield	Coarse-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Laidig	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols.
Leetonia [1]	Sandy-skeletal, mixed, mesic	Entic Haplorthods	Spodosols.
Lehew	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Markes	Loamy-skeletal, mixed, mesic	Typic Ochraqualfs	Alfisols.
Meckesville	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols.
Melvin	Fine-silty, mixed, nonacid, mesic	Typic Fluvaquents	Entisols.
Monongahela	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols.
Murrill [1]	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Nolin	Fine-silty, mixed, mesic	Dystric Fluventic Eutrochrepts	Inceptisols.
Penlaw	Fine-silty, mixed, mesic	Aquic Fragiudalts	Alfisols.
Philo	Coarse-loamy, mixed, mesic	Fluvaquentic Dystrochrepts	Inceptisols.
Pope	Coarse-loamy, mixed, mesic	Fluventic Dystrochrepts	Inceptisols.
Purdy	Clayey, mixed, mesic	Typic Ochraquults	Ultisols.
Ryder	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Tyler [1]	Fine-silty, mixed, mesic	Aeric Fragiaquults	Ultisols.
Vanderlip [1]	Sandy, siliceous, mesic	Psammentic Hapludults	Ultisols.
Very stony land, Dekalb soil material.	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Warners	Fine-silty, carbonatic, mesic	Fluvaquentic Haplaquolls	Mollisols.
Weikert	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols.

[1] These soils are taxadjuncts. In Franklin County they are outside the defined range for the series in the following ways:
Dunning soils have chromas of 2 to 8 in the middle and lower parts of the B horizon and in the C horizon.
Edgemont soils are 35 to 45 percent coarse fragments in the textural control section.
Leetonia soils are 34 to 40 inches deep over bedrock.
Murrill soils are dominantly medium acid.
Tyler soils do not have mottles immediately below the Ap horizon, and depth to the fragipan is mainly 24 to 30 inches.
Vanderlip soils have an aggregate thickness of lamellae of 3 to 6 inches.

The profiles sampled are representative of the Berks, Duffield, Dunning overwash variant, and Markes series. They differ from the series as correlated in Franklin County in that the Berks soil has a surface layer of loam, the Markes soil has a surface layer of silty clay loam, and the Duffield soil has higher base saturation.

Methods of Analysis

Bulk samples of about gallon-size were brought to the laboratory, air dried, crushed with a wooden rolling pin, and sieved to remove coarse fragments. Coarse fragment data are presented as a percentage of the air-dry weight of the total bulk sample. Volume percentage of coarse fragments was calculated, multiplying the weight percentage by bulk density of the total soil mass and dividing by the density of the coarse fragments as measured for the core samples.

Particle-size distribution of fine earth (smaller than 2 millimeters) was determined by the pipette method (*9*) and is presented as a percentage of the weight of oven-dried fine earth.

Where possible, triplicate 1- by 2-inch cores were taken from each horizon with a modified Uhland core sampler (*16*). Bulk density of the material smaller than 2 millimeters in diameter in the cores was determined by subtracting the weight and volume of the coarse

TABLE 12.—*Mechanical analyses and*

[Dashes in columns indicate sample not taken or material not present. Analyses

Soil series and sample number	Horizon	Depth from surface	Particle size distribution									
			Sand					Silt		Total		
			Very coarse (2.0 to 1.0 mm)	Coarse (1.0 to 0.5 mm)	Medium (0.5 to 0.25 mm)	Fine (0.25 to 0.10 mm)	Very fine (0.10 to 0.05 mm)	(0.05 to 0.005 mm)	(0.005 to 0.002 mm)	Sand (2.0 to 0.05 mm)	Silt (0.05 to 0.002 mm)	Clay (less than 0.002 mm)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Berks:												
S65–Pa 28–5–1	Ap	0–10	15.8	13.0	6.8	4.1	3.4	33.1	9.7	43.1	42.8	14.1
S65–Pa 28–5–2	B21	10–18	12.5	15.6	10.1	6.2	4.3	26.7	12.1	48.7	38.8	12.5
S65–Pa 28–5–3	B22	18–26	9.4	13.5	10.7	5.8	3.7	28.5	9.5	43.1	38.0	18.9
S65–Pa 28–5–4	C	26–36	6.1	11.8	9.5	5.8	3.2	28.6	13.1	36.4	41.7	21.9
Duffield:												
S65–Pa 28–12–1	Ap	0–10	.8	1.4	1.8	4.5	15.8	48.2	11.3	24.3	59.5	16.2
S65–Pa 28–12–2	B21t	10–20	.6	1.0	1.6	4.1	13.6	43.3	12.0	20.9	55.3	23.8
S65–Pa 28–12–3	B22t	20–29	3.0	4.0	3.9	7.2	14.0	35.4	6.1	32.1	41.5	26.4
S65–Pa 28–12–4	B23t	29–40	1.7	4.1	3.8	7.0	13.0	36.3	8.5	29.6	44.8	25.6
S65–Pa 28–12–5	B24t	40–56	1.0	1.6	1.8	3.5	7.0	40.8	8.4	14.9	49.2	35.9
S65–Pa 28–12–6	C	56–95	.2	1.8	1.3	9.3	11.6	30.7	3.0	24.2	33.7	42.1
Dunning overwash variant:												
S65–Pa 28–10–1	Ap	0–10		.9	6.3	7.7	11.6	53.7	11.9	26.5	65.5	7.9
S65–Pa 28–10–2	B21	10–21	.1	1.0	4.0	6.9	8.0	51.0	19.8	20.0	70.8	9.2
S65–Pa 28–10–3	B22g	21–26	.1	.8	2.6	3.5	6.3	41.3	20.1	13.3	61.4	25.3
S65–Pa 28–10–4	IIa1b	26–32	1.2	7.6	12.2	2.9	1.3	32.2	10.3	25.2	42.5	32.3
S65–Pa 28–10–5	IIB2bg	32–46	.1	4.9	7.9	7.2	7.5	24.2	9.2	27.6	33.4	39.0
S65–Pa 28–10–6	IIICg	46–56	6.2	13.7	18.3	12.0	7.4	8.2	4.6	57.6	12.8	29.6
Markes:												
S65–Pa 28–8–1	Ap	0–11	3.1	4.5	3.4	1.9	3.1	40.0	16.4	16.0	56.4	27.6
S65–Pa 28–8–2	B21tg	11–20	2.9	3.4	3.3	4.4	9.6	37.7	10.0	23.6	47.7	28.7
S65–Pa 28–8–3	B22tg	20–27	9.9	4.8	2.8	3.4	9.9	34.4	11.1	30.8	45.5	23.7
S65–Pa 28–8–4	Cg	27–32	6.1	6.3	5.4	4.9	7.7	34.6	11.4	30.4	46.0	23.6

[1] The data show this profile of the Berks series to have a surface layer of loam. Most of the Berks soils in Franklin County have a surface layer of shaly silt loam.

physical properties of selected soils

made at the Pennsylvania State University Soil Characterization Laboratory]

Textural class	Coarse fragments larger than 2.0 mm—				Bulk density at field moisture of—		Moisture-holding capacity at—		Available water (total soil)
	76 to 19 mm	19 to 2.0 mm	Total percent by weight	Total percent by volume	Material in cores finer than 2 mm	Whole soil including coarse fragments	1/3-bar tension (core)	15-bar tension (2 mm sieved)	
	Percent	*Percent*			*g/cc*	*g/cc*	*Percent*	*Percent*	*In/in of soil*
Loam [1]	....	40	40	38	1.30	1.35	21.7	9.9	0.16
Loam	8	65	73	57	1.10	1.75	18.4	10.1	0.15
Loam	21	60	81	67	1.01	1.78	15.9	10.7	0.09
Loam	32	52	84	72	1.10	1.96	17.3	10.8	0.13
Silt loam	....	3	3	2	1.34	1.34	24.9	7.8	0.23
Silt loam	....	17	17	12	1.47	1.57	23.5	11.0	0.20
Loam	....	18	18	12	1.37	1.47	28.6	13.2	0.23
Loam	....	34	34	21	1.32	1.60	30.0	13.5	0.27
Silty clay loam	....	8	8	5	1.21	1.25	30.8	19.6	0.14
Clay	....	2	2	1	1.20	1.21	39.0	21.0	0.22
Silt loam	....	....	....	....	1.23	1.23	30.2	8.7	0.26
Silt loam	....	1	1	1	1.33	1.33	25.5	11.2	0.19
Silt loam	....	....	....	....	1.28	1.28	31.7	16.5	0.19
Clay loam	....	52	52	39	1.29	1.64	35.4	18.6	0.26
Clay loam	....	48	48	40	1.45	1.74	31.9	18.2	0.24
Sandy clay loam	11	38	49	42	1.51	1.72	27.2	5.1	0.38
Silty clay loam [2]	....	28	28	20	1.18	1.31	30.2	13.8	0.21
Clay loam	15	58	73	67	1.45	1.78	21.6	11.3	0.18
Loam	32	48	80	71	......	......	......	10.8	......
Loam	[3]43	37	88	81	......	......	......	13.5	......

[2] The data show this profile of the Markes series to have a surface layer of silty clay loam. Most of the Markes soils in Franklin County have a surface layer of shaly silt loam.

[3] percent coarser than 76 millimeters.

TABLE 13.—*Chemical*

[Dashes in columns indicate sample not taken or material not present. Analyses

Soil and sample number	Horizon	Depth from surface	Organic carbon	Nitrogen	Carbon nitrogen ratio	Carbon magnesium ratio	Extractable cations [1] (Milliequivalents per 100 grams of soil)				
							Calcium	Magnesium	Sodium	Potassium	Acidity
		Inches	*Percent*	*Percent*							
Berks shaly silt loam:											
S65–Pa 28–5–1	Ap	0–10	1.84	0.15	12	4.0	9.3	2.3	0.2	0.4	9.4
S65–Pa 28–5–2	B21	10–18	.40	.08	5	2.0	4.7	2.4	.1	.3	8.2
S65–Pa 28–5–3	B22	18–26	.23	......	....	.9	3.0	3.4	.1	.2	9.4
S65–Pa 28–5–4	C	26–36	.31	.08	4	.8	2.9	3.8	.2	.3	9.4
Duffield silt loam:											
S65–Pa 28–12–1	Ap	0–10	.90	.08	11	5.8	11.0	1.9	.2	.5	3.6
S65–Pa 28–12–2	B21t	10–20	.13	......	....	2.1	7.8	3.8	.2	.3	6.5
S65–Pa 28–12–3	B22t	20–29	.15	......	....	1.0	7.7	7.7	.2	.3	8.9
S65–Pa 28–12–4	B23t	29–40	.10	......	....	.5	5.2	11.5	.2	.3	4.7
S65–Pa 28–12–5	B24t	40–56	.13	......	....	.5	6.0	11.6	.2	.4	6.0
S65–Pa 28–12–6	C	56–95	.17	......	....	.4	4.7	12.0	.2	.6	7.4
Dunning silt loam, overwash variant:											
S65–Pa 28–10–1	Ap	0–10	1.89	.15	13	19.3	30.8	1.6	.2	.2	2.0
S65–Pa 28–10–2	B21	10–21	1.26	.11	11	16.4	27.9	1.7	.2	.2	3.4
S65–Pa 28–10–3	B22g	21–26	1.99	.16	12	8.8	21.0	2.4	.2	.1	4.1
S65–Pa 28–10–4	IIA1b	26–32	2.21	.17	13	7.2	26.0	3.6	.2	.2	4.9
S65–Pa 28–10–5	IIB2bg	32–46	.89	.06	15	5.3	20.7	3.9	.2	.2	2.1
S65–Pa 28–10–6	IIICg	46–56	.79	.05	16	4.4	11.0	2.5	.2	.1	2.3
Markes shaly silt loam:											
S65–Pa 28–8–1	Ap	0–11	1.84	.19	10	5.7	13.7	2.4	.2	.6	7.6
S65–Pa 28–8–2	B21tg	11–20	.46	.06	8	3.3	9.3	2.8	.2	.3	5.3
S65–Pa 28–8–3	B22tg	20–27	.27	.05	5	1.2	5.6	4.6	.2	.5	7.9
S65–Pa 28–8–4	Cg	27–32	.32	.07	5	.8	5.0	5.9	.2	.6	13.5

[1] $BaCl_2$—triethanolamine extraction.
[2] Chlorite—vermiculite.

properties of selected soils

made at The Pennsylvania State University Soil Characterization Laboratory]

Cation exchange capacity (sum)	Base saturation (sum)	Calcium carbonate equivalent	Reaction of 1:1 solution of soil in—			Free iron oxide (Fe_2O_3)	Mineral composition of clay fraction					
			Water	1N KCl	0.01*M* $CaCl_2$		Kaolinite	Illite	Vermiculite	Montmorillonite	Chlorite	Interstratified [2]
Meq/100 gms soil	*Meq/100 gms soil*	*Percent*	*pH*	*pH*	*pH*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
21.6	56	....	6.4	5.4	6.2	3.7	....	40	20	....	....	40
15.7	48	....	5.5	4.4	5.4	3.9	....	50	30	....	....	20
16.1	42	....	5.2	3.9	4.8	4.7	....	60	20	....	....	20
16.6	43	....	4.8	4.1	4.7	3.9	....	60	20	....	....	20
17.2	[3] 79	....	7.4	6.1	7.0	2.1	....	10	20	10	40	20
18.6	65	....	6.5	5.1	6.3	2.0	....	10	20	10	50	10
24.8	64	....	6.3	5.0	6.1	2.1	....	10	40	15	20	15
21.9	78		6.3	5.1	6.2	2.3	....	30	20	30	10	10
24.2	75	....	6.3	5.4	6.2	2.2	....	20	30	10	20	20
24.9	70	....	6.0	5.0	5.8	2.2	....	30	10	40	10	10
34.8	94	4	7.9	7.0	7.6	2.4	....	20	30	....	30	20
33.4	90	3	8.0	6.9	7.7	2.4	....	20	40	10	20	10
27.8	85	3	7.7	6.3	7.3	2.2	....	20	40	10	10	20
34.9	86	3	7.7	6.4	7.4	2.3	....	10	30	20	10	30
27.1	92	1	7.6	6.5	7.4	2.2	10	10	30	20	10	20
16.1	86	1	7.2	6.4	6.8	2.0	10	10	30	20	10	20
24.5	69	....	6.9	5.9	6.7	3.4	....	40	40	....	....	20
17.9	70	....	7.1	5.7	6.8	2.7	....	50	30	....	....	20
18.8	58	....	5.4	4.3	4.8	2.2	....	50	30	....	....	20
25.2	46	....	5.5	3.9	5.2	2.0	....	60	30	....	....	10

[3] This profile of the Duffield series has base saturation higher than most Duffield soils in Franklin County.

TABLE 14.—*Percolation rates*

[Tests performed in conjunction with Institute on Land and Water Resources at The Pennsylvania State University. Test results for a number of holes within a few feet of each soil sampling site]

Soil and sample number	Number of holes	Minimum	Maximum	Median rate
		Inches per hour	*Inches per hour*	*Inches per hour*
Berks shaly silt loam: S65 Pa 28–5 (1–4).	7	0	11.0	0.2
S65 Pa 28–12 (1–6).	8	0	14.8	0.2
Dunning silt loam, overwash variant: S65 Pa 28–10 (1–6).	8	0.2	1.0	0.6
Markes shaly silt loam: S65 Pa 28–8 (1–4).	8	0	0	0

fragments from the total weight and volume. Bulk density of the total soil mass is based on density of the fine earth and coarse fragments in the cores, but taking into account the weight percentage in the bulk sample. Coarse fragments from 2-inch cores are considered representative in density where most of the fragments are less than 1 or 2 inches in diameter. Both bulk density values correspond to moisture content of the sample.

Cores were also equilibrated at one-third bar on a tension plate (*18*), and percentage of moisture, by weight, was determined for the entire core, including coarse fragments. The percentage of moisture, by weight, of sieved fine earth was determined at 15 bars tension with a pressure membrane apparatus. Available water capacity was estimated by subtracting the percentage of moisture at 15 bars tension from that at one-third bar tension and multiplying by the bulk density of the total soil mass. The available water capacity is expressed in inches per inch of soil.

Organic carbon was determined by a modification (*13*) of the Walkley-Black wet oxidation method. The Kjeldahl method (*4*) was used for determination of total nitrogen.

Calcium, magnesium, sodium, and potassium were extracted with neutral 1*N* ammonium acetate solution. Calcium and magnesium were determined by titration, and sodium and potassium were determined by flame-emission spectrophotometry. A barium chloride-triethanolamine extract, pH 8.1, was back-titrated with 0.05 *N* hydrochloric acid solution to determine extractable acidity (*11*). Calcium carbonate was determined by weight loss of carbon dioxide from a sample treated with acid (*2*).

Soil reaction was measured with a pH meter and glass electrode on samples that had been air dried. A 1:1 soil-to-solution ratio was used.

A sodium dithionite extract was titrated with dichromate to determine the percentage of free iron oxide (*8*).

Clay minerals were identified by X-ray diffraction with copper radiation, Geiger counter, and chart recorder. Prior to X-ray analysis the air-dried samples were treated with hydrogen peroxide to destroy organic matter. Iron oxides were removed by sodium dithionite-citrate-bicarbonate extraction (*12*) or by treatment with oxalic acid, potassium oxalate, and magnesium ribbon (*7*). Clay was separated with a centrifuge; one part was then saturated with potassium ions and another with magnesium ions. The clay suspensions were placed on glass slides, allowed to air dry, and used to obtain diffraction trace. The magnesium-saturated slide was then vapor-solvated with ethylene glycol, and the potassium slide was heated to 300° C. and 550° C., successively. Diffraction traces were interpreted on the basis of peak height and relationship to known soil-clay mixtures. Estimates were made to the nearest 5 to 10 percent.

Percolation rates in table 14 were determined as outlined by the U.S. Public Health Service (*21*). Several holes were dug 36 inches deep near each sampling site. After presoaking for a day, the depth of water in the holes was adjusted to 6 inches from the bottom, and the rate of decrease in the water level was measured in inches per hour while the water level was maintained at 4 to 6 inches from the bottom. The test was run continuously for several hours.

Summary and Significance of Data

Particle-size distribution and coarse fragment content.—The various sizes of mineral particles in these soils are governed chiefly by the parent material in which the soils formed. The Berks and Markes soils formed in residuum weathered from shale. The mineral particles weathered from the shale are mostly silt and clay size. Many fragments of consolidated shale remain relatively unweathered, however, so that more than half the soil volume is shale fragments. The Duffield soil formed in residuum derived from a limestone formation that contained a great deal of silt and clay. The limestone dissolved and the silt and clay remained. Thus, the Duffield soil is deeper and has fewer coarse fragments than the Berks or Markes soils.

The Dunning parent material probably was originally deposited by floodwaters on the flood plain of a stream. The upper layers are practically devoid of coarse fragments and are dominated by silt. The lower horizons have more gravel than the upper horizons, indicating that this material was deposited by rapidly moving water.

Bulk density.—Bulk density is an expression of the weight of oven-dry soil per unit of bulk volume, including pore space. Low bulk density values of 1.25 grams per cubic centimeter or less indicate a high percentage of pores and good aeration, unless the soil is waterlogged. Soils that have low bulk density are generally more desirable for farming. Subsoils commonly have a bulk density of 1.4 or higher. All sampled soils have relatively low bulk densities. Aeration is not particularly good, however, in Dunning or Markes soils unless some type of artificial drainage is installed to remove excess water in wet seasons.

The bulk density of the soil, including coarse fragments, is useful, for instance, in estimating the total weight of material to be taken from an excavation of known volume or for calculating available water-holding capacity in the root zone. The density of the fragments sampled in the cores varies from 1.8 grams per cubic centimeter for soft shale fragments in some horizons up to 2.5 for harder fragments in other horizons. These differences affect bulk density of the total soil mass significantly where the content of coarse fragments is high.

Moisture-holding capacity.—The amount of water in the soil at one-third bar tension is a rough approximation of the field moisture capacity, or the amount of water held against gravity after drainage through the soil has essentially stopped. The 15-bar water determination is an approximation of the permanent wilting point, or the soil water content at which plants wilt without recovery. Subtraction of the percentage of water held at 15 bars from that held at one-third bar tension gives an estimate, on a weight percentage basis, of the capacity of the soil to store water available to plants. In table 12 this available moisture capacity is reported on a volume basis, or in inches of water per inch of soil. The effect of coarse fragments, which hold little or no available water, is partly accounted for by the coarse fragments in the cores.

Available water capacities are high for Duffield and Dunning soils. These data do not apply for the Dunning soils unless they have been artificially drained, because under natural conditions these soils have a high water table. The available water capacity of Berks and Markes soils is lowered somewhat by the large amount of shale fragments and the moderate depth to bedrock. Because the Markes soil has restricted drainage, it frequently has excess water, and the estimates of available water have little practical application.

Organic carbon and nitrogen.—For most soils the amount of organic carbon in the surface layer multiplied by 2 gives an estimate of the percentage of total organic matter. For example, the Ap horizon of Duffield soils contains a little less than 2 percent organic matter, by weight, and about 98 percent mineral material. The percentage of organic matter on a volume basis would be perhaps 2 or 3 times more, because organic matter is much less dense than soil mineral material. Organic matter, mostly dark, humified material, has beneficial effects on the structure, workability, and nutrient-holding capacity. It is normally concentrated in the topsoil, where plants and other organisms leave most of their remains for decay. The large percentage of organic matter in the IIA1b horizon of the Dunning overwash variant soil marks the surface horizon of a buried soil that was poorly drained.

Soil organic matter contains nitrogen, which becomes available to plants only when released by microbial activity. The surface horizon of a typical farming soil has a carbon:nitrogen ratio of perhaps 10 to 12. Soils under forest in many places have higher ratios. The very low C:N ratios in the subsurface horizons of Berks and Markes soils are probably due to fixing of nitrogen on clay minerals.

Calcium carbonate equivalent.—Small amounts of carbonates in the Dunning soil may be from ground waters containing dissolved limestone. The other soils have no appreciable amounts of carbonates in them.

Extractable cations.—Some soil mineral and organic particles absorb positively charged ions (including calcium, magnesium, sodium, and potassium), traditionally called bases, as well as acidic cations (including aluminum and hydrogen ions). All these cations are held in the soil against leaching by water, but many can be displaced by other cations in solution. Each soil has a particular capacity to hold cations, and the total of extractable cations plus acidity is a measure of the cation-exchange capacity. Base saturation is the percentage of the cation-exchange capacity satisfied by bases.

In a humid climate such as that of Franklin County, well-drained soils are leached by percolating water. Repeated leaching removes carbonates if they are present and replaces basic cations with acidic cations. Berks, Duffield, and Markes soils have been acidified by this process. There is evidence that acidity near the surface has been ameliorated somewhat by liming. The subsoil is not so thoroughly leached as in many soils in Pennsylvania and, in fact, the Duffield soil analyzed exhibits an unusually high base saturation, possibly higher than most Duffield soils in the county. A Duffield soil as defined has between 35 and 60 percent base saturation in its subsoil.

Dunning soils formed under the influence of an alkaline water table and, therefore, are not leached. If the soil is artificially drained, the leaching process starts but is so slow that little difference is likely to be noted in a person's lifetime.

pH.—The percentage of base saturation and pH are roughly related in that the pH is low where base saturation is low. The pH of a soil in water suspension is most often used in the United States; pH is sometimes measured in salt solutions to help eliminate seasonal differences in salt concentration. The pH is generally lower in a salt solution than in water. Measurement of pH can be done quickly and easily, which is why it is the most used single chemical measurement. The pH is useful for interpretations of soil fertility, especially if detailed information such as that in table 13 is available for related soils.

Free iron oxides.—Iron oxide content is low in these soils, and the slight variations are of no known practical significance. Iron chemically bound within silicate mineral structures is not measured by the "free iron" method, and total iron values may be higher than shown.

Clay minerals.—The mineralogical composition of the clay fraction in soil material is in many ways as important as the total amount of clay. Illite (soil mica), an important mineral in many soil parent materials, contains potassium in a form not readily available to plants. When weathered in soils, illite very slowly loses its potassium and is transformed to vermiculite, or perhaps montmorillonite or interstratified mixtures of these minerals with chlorite. Large percentages of kaolinite indicate that the soil material is highly weathered.

Montmorillonite and vermiculite have high cation-exchange capacities compared to the other minerals and,

therefore, enhance the soil's ability to store some plant nutrients in an available form. Excessive amounts of these minerals and a high content of clay are generally undesirable, because they cause shrinking and swelling and other unfavorable conditions.

The Berks and Markes soils, both derived from weathered shale, are dominated by illite for the most part. Illite tends to be a little less plentiful at the surface than elsewhere and vermiculite, a little more plentiful. This is attributed to the weathering of illite to vermiculite where weathering is strongest. Montmorillonite, kaolinite, or chlorite was not detected, and the interstratified material is chlorite-vermiculite. The mineralogy of these soils is representative of many Pennsylvania soils.

The Duffield soil has less illite and relatively large amounts of montmorillonite and chlorite, which are unusual in distribution and properties. It is not considered representative of Pennsylvania soils and probably is not representative of many Duffield soils in other areas. The minerals appear to be all trioctahedral.

The Dunning soil is derived from sediment deposited by streams. The distribution of clay minerals suggests that the sediments deposited at this site were derived from watersheds that had soils similar to Duffield soils rather than soils similar to Berks and Markes soils.

Percolation rates.—Results of field percolation tests (table 14) demonstrate the extreme variability of this soil property. In most test holes at the Berks and Duffield sites water percolated very slowly, but in one test hole for each soil water percolated rapidly. Probably the percolation hole intersected a direct channel into the substratum.

Environmental Factors Affecting Soil Use

This section provides general information about the area significant to soil use. It describes the history and development, climate, and geology of the county, and provides some statistics on population and transportation. In addition, it shows recent farm statistics.

History and Development

Franklin County, named in honor of Benjamin Franklin, was organized in September 1784. It extended from southwest of Cumberland County to the present Pennsylvania State line. Before settlement by the white man, the Cumberland Valley was a prized hunting ground of the Indians. The county has played an important part in the historic development of the area. The fifteenth president of the United States, James Buchanan, was born in Buck Run, near Foltz. The county courthouse was destroyed in 1864, when Confederate forces burned Chambersburg.

The fertile soils of Franklin County attracted settlers as early as 1725. The Cumberland Valley was the first section farmed, followed by Path Valley and then by Little Cove Valley. Since its organization, the county has ranked as one of the best farming counties in the State.

The county is steadily gaining new commercial and industrial enterprises. Letterkenny Army Depot, a Federal installation, is the largest single employer (*6*) in the county.

Climate[8]

Franklin County, in the extreme south-central part of Pennsylvania, is in the Lower Susquehanna climatic division, and the climate is classified as humid continental. Most weather systems that affect this area originate in Canada or on the Central Plains of the United States, are caught up in the prevailing westerly flow aloft, and, as they travel eastward, gradually acquire some of the characteristics of the underlying land. As these air masses move over the Appalachians, moisture is lost in the form of precipitation. The main source of moisture for these weather systems is the Gulf of Mexico, although southerly and southeasterly flow off the Atlantic occasionally provides an added source.

By the time an air mass has passed over the Appalachian chain, including Cove, Tuscarora, Kittatinny, and North Mountains along the western border of Franklin County, it is considerably modified in both temperature and moisture. Warm, moist air frequently flows northward up the broad Cumberland Valley. After cooling and losing moisture while traversing the mountains, an air mass tends to warm and at least partly replenish its moisture supply over the valley. Orographic uplift along the windward side of South Mountain, which serves as the county's eastern border, results in increased cloudiness and the greatest precipitation in the county along this ridge. Annual temperatures generally average near 53° F over the Great Valley, but at higher elevations along the western and eastern borders they average two to three degrees colder. Precipitation also follows these topographical features; the annual average is 40 inches in the western mountain and valley region and approximately 45 inches in the South Mountain region. The lower totals along the western border are due to the drying of the air mass over the mountains farther west and the lack of a moisture source.

In summer cold frontal passages are infrequent, and, after modification over the mountains, a change in air mass is sometimes difficult to ascertain. Several periods of hot and humid weather are observed, however, and valley temperatures reach into the nineties about 30 times during summer. The record high was 107° at Chambersburg on July 10, 1936. Average temperature and precipitation data are shown in table 15. On the average, daytime highs reach the mid to upper eighties and nighttime lows are near 60°. Temperatures in the mountains are somewhat cooler. Data in table 16 indicate that freezing temperatures have not been experienced during summer in the valley. Cloud cover is at a minimum in summer; the county receives more than 60 percent of the available sunshine, and nights are

[8] By PAUL W. DAILEY, JR., State climatologist, National Weather Service, U.S. Department of Commerce.

TABLE 15.—*Temperature and precipitation*
[Data recorded at Chambersburg]

Month	Temperature				Precipitation					
	Average daily maximum	Average daily minimum	Average extreme maximum	Average extreme minimum	Average total	One year in 10 will have— Less than:	One year in 10 will have— More than:	Average monthly snowfall	Average number of days that have snow cover of— 1 inch or more	Average number of days that have snow cover of— 6 inches or more
	°F	°F	°F	°F	Inches	Inches	Inches	Inches		
January	40	24	58	6	3.0	1.55	5.37	7.6	10	2
February	41	24	61	7	2.3	1.29	3.51	5.8	8	3
March	50	30	72	14	3.8	2.27	5.53	7.3	4	1
April	63	39	84	27	3.5	1.71	5.23	([1])	([1])	([1])
May	75	50	90	33	4.1	1.69	6.43	([2])	0	0
June	83	58	95	44	4.1	2.07	6.54	0	0	0
July	87	63	98	50	4.0	1.85	5.97	0	0	0
August	85	61	96	47	4.1	1.64	5.81	0	0	0
September	78	54	93	37	3.3	1.55	6.03	0	0	0
October	67	43	84	27	3.2	0.92	5.31	([1])	0	0
November	53	33	72	18	3.1	1.35	5.07	1.5	1	([1])
December	41	25	60	7	3.0	1.22	4.87	6.0	7	2
Year	64	42	[3] 107	[4] –13	41.5	34.42	46.69	28.2	30	8

[1] Less than 0.5 day.
[2] Trace.
[3] Highest temperature for period 1931–60.
[4] Lowest temperature for period 1931–60.

TABLE 16.—*Probabilities of last freezing temperatures in spring and first in fall*
[Data recorded at Chambersburg, Pennsylvania]

Probability	Dates of given probability for temperatures of— 16° F or lower	20° F or lower	24° F or lower	28° F or lower	32° F or lower
Spring:					
1 year in 10 later than	March 22	March 27	April 11	May 2	May 11
2 years in 10 later than	March 20	March 25	April 4	April 25	May 2
5 years in 10 later than	March 9	March 14	March 27	April 15	April 25
Fall:					
1 year in 10 earlier than	November 21	November 12	November 3	October 7	September 27
2 years in 10 earlier than	November 26	November 19	November 6	October 15	October 4
5 years in 10 earlier than	December 4	November 25	November 14	October 27	October 14

generally clear. The prevailing wind is southwest and averages 8 miles per hour. Rainfall is generally adequate, but dry periods of 2 to 3 weeks are sometimes experienced. Summer rainfall is usually in the form of afternoon or evening thundershowers, which occur on an average of 24 days during the period June through August.

Winters are rather cloudy and cold. Cold frontal passages are frequent, and prevailing winds are west to northwest and average 10 miles per hour. Daytime highs in the valley average in the low forties, and nighttime lows dip into the lower twenties. Seventy-degree readings have been experienced in the middle of winter, but such occurrences are rare and short-lived. Sub-zero readings occur only an average of once annually. An unusually cold air mass settled over the area on February 2, 1961, when Chambersburg reported a record low of –16° F.

Although snow flurries and a light snow cover are often observed earlier in the mountains, the first snowfall of any significance in the valley usually occurs late in November or during December. Most storms deposit less than 10 inches of new snow, but a few have exceeded 15 inches. Two types of winter storms are most conducive to heavy snows in Franklin County, assuming temperatures are cold enough. These are low pressure systems that develop in the lower Mississippi Valley and move northeastward just south of the area and deep lows that form in the Carolinas and track northward along the east coast. Thawing is frequent, and snow cover persists for only a short time. An exception to this was a 60-day period from December 28, 1944, to February 25, 1945, when the snow cover never was less than 1 inch. Snow cover of an inch or more is normally observed much more often in the mountains, especially on north- and east-facing slopes, than in the valley where the seasonal average is 30 days of snow cover. By the end of March the threat of snow tapers off rapidly.

Spring and fall are the transition periods. Prevailing

winds are westerly and average 10 miles per hour. Summerlike temperatures are observed with increasing regularity in April, when the average monthly maximum in the mid-sixties indicates the shift to the summer season. The fall month of October is very pleasant; daytime high temperatures still break 70° frequently, and abundant sunshine illuminates the autumnal change in colors.

The length of the growing season is fairly consistent over the valley and averages 160 to 170 days; however, some years deviate considerably from the average. The longest recorded growing season was 198 days, and the shortest was 119 days. Frost occurs as late as May 25 and as early as September 21. A somewhat shorter growing season exists in the mountains.

About 57 percent of the annual precipitation falls during spring and summer. Thunderstorms occur most frequently during summer, but have been observed at one time or another each month of the year. On the average thunderstorms occur on 11 days in spring, 6 in fall, 1 in winter, and 24 in summer, which is an average of 42 days a year. Great extremes in monthly precipitation have been observed. Chambersburg recorded only 0.11 inch in October 1963, but received 9.82 inches in June 1928. About once every 25 years a 24-hour rainfall of about 5 inches is likely.

Hurricane winds do not affect Franklin County, but the heavy rains associated with these storms have spread inland as far as central Pennsylvania. Damage from strong winds and hail accompanying severe thunderstorms are recorded each year. Since 1854, when records were first kept on such storms, six tornadoes have been sighted in Franklin County; however, no fatalities have resulted from these storms, and only two people have been injured.

Geology

Rocks underlying the county had their origin millions of years ago when volcanic material and layers of sand, gravel, silt, and limy material were formed or deposited. After subjection to pressure for long periods of time, the sand, gravel, silt, and limy material evolved into sedimentary rocks, such as shale, sandstone, conglomerate, and limestone. Faulting, tilting, folding, and uplift, followed by erosion, exposed the rocks and shaped the landscape.

Exposed rocks in the county were formed during five geologic periods, the oldest of which was the Precambrian, followed by the Cambrian, Ordovician, Silurian, and Devonian.

The Precambrian rocks are exposed along the Adams County line in the extreme southeastern part of the county. They are volcanic rocks. The Cambrian rocks are exposed in the eastern part of the county. They are limestone and dolomite interbedded with shale, siltstone, and some sandstone. The Ordovician rocks exposed throughout most of the county are sandstone, shale, limestone, and dolomite. The Silurian rocks exposed in the extreme western part of the county are shale, sandstone, quartzite, and limestone. The Devonian rocks exposed in the extreme southwestern part of the county are sandstone, shale, and cherty limestone.

Some clay pockets occur along with iron ore deposits in the Cambrian rocks; however, the high silica content limits use of the clay. Barite, in very limited quantities, has been located near Waynesboro. Large deposits of quartz sand, building stone, limestone, cement material, and clay and shale for ceramics, and materials for grit manufacture are present in the county. The grit is used in asphalt roofing and siding.

Population and Transportation

According to the U.S. Bureau of the Census, the population of Franklin County in the period 1950 to 1960 increased from 75,982 to 88,172. This represents an increase of 16 percent. The population continued to increase and reached a total of 100,833 in 1970, at which time the rural population numbered 58,850 and the urban population numbered 31,983.

One Interstate and two U.S. highways serve Franklin County. U.S. Highway 30 passes east to west through Fort Loudon, Chambersburg, and Fayetteville; U.S. Highway 11 passes north to south through Greencastle, Chambersburg, and Shippensburg; and Interstate 81 parallels U.S. Highway 11. The Pennsylvania Turnpike bisects the northern part of the county. The Willow Hill and Blue Mountain Interchanges link the Turnpike with Pennsylvania Highways 75 and 997.

Two railroads serve the county. Although there is not a commercial airport in the county at present, one is being planned.

Farming

In the past few years the number of farms in Franklin County has decreased, but the average size of the farms and the total acreage farmed have increased. The 1,957 farms in the county in 1964 had an average of 143.7 acres, and in 1969 the 1,643 farms had an average of 155.7 acres. The total acreage increased from 281,144 acres in 1964 to 285,834 in 1969.

In 1969 the principal crops had the following yields: corn for grain, 2,754,126 bushels; wheat, 414,536 bushels; and hay, 120,000 tons. Orchards occupied 7,719 acres. The main fruits harvested in 1969 were 74,099,069 pounds of apples, 15,726,462 pounds of peaches, and 869,947 pounds of sour cherries.

The number of cattle and calves on farms in the county increased from 60,282 in 1964 to 67,123 in 1969. Other livestock included 19,152 hogs and pigs, 2,079 sheep and lambs, and 247,659 chickens.

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Glossary

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Aporhyolite. A felsite whose structure shows it to have been originally vitreous like some rhyolites.

Available water capacity (also termed available moisture capacity).
The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate.
Synonyms: clay coat, clay skin.

Coarse fragments. Mineral or rock particles more than 2 millimeters in diameter.
Gravel. Rounded or angular rock fragments that are not prominently flattened and are up to 3 inches in diameter.
Cobblestones. Rounded or partly rounded rock fragments 3 to 10 inches in diameter.
Channery. Thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length along the longer axis.
Shaly soil. Soil that has flattened fragments of sedimentary rock as much as 6 inches in length along the longer axis.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Conglomerate. Rock composed of gravel and rounded stones cemented together by hardened clay, lime, iron oxide, or silica.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—
Loose.—Noncoherent when dry or moist; does not hold together in a mass.
Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard and brittle; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour or are parallel to terraces or diversions. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Cover crop. A close-growing crop grown primarily to improve and to protect the soil between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

Drainage class (natural). Refers to the conditions of frequency of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.
Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A horizon and upper part of the B horizon and have mottling in the lower part of the B horizon and the C horizon.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Green manure (agronomy). A crop grown for the purpose of being turned under in an early stage of maturity or soon after maturity for soil improvement.

High water table. A saturated zone in the soil that is within 6 inches of the surface throughout the year. It results from a normal or perched water table. The presence of a high water table is indicated by mottling within 6 inches of the surface, and it is associated with poorly drained and very poorly drained soils.

Minimum tillage. The least amount of tillage required for quick germination and a good stand.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimensions; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Seasonal high water table. A saturated zone in the soil that is within 6 to 36 inches of the surface during at least part of the year. It is generally associated with a perched water table and somewhat poorly drained and moderately well drained soils. It is indicated by mottling 6 to 36 inches from the surface.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Slope. Gradient of the soil. Nearly level is 0 to 3 percent, gently sloping is 3 to 8 percent, sloping is 8 to 15 percent, moderately steep is 15 to 25 percent, steep is 25 to 35 percent, and very steep is more than 35 percent.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Stubble mulching. Leaving plant residue of a previous crop as mulch on the soil surface when preparing for and planting the next crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface layer. A term used in nontechnical soil descriptions for one or more layers above the subsoil. Includes A horizon and part of the B horizon; has no depth limit.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Upland (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

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GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. In referring to a capability unit, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Soil associations, table 1, page 4.
Estimated yields, table 2, page 22.
Woodland, table 3, page 26.
Community development, table 5, page 34.
Recreation, table 6, page 48.
Engineering, tables 7, 8, and 9, pages 56 through 73.
Acreage and extent, table 10, page 76.

Map symbol	Mapping unit	Page	Capability unit Symbol	Capability unit Page
AlB	Allegheny loam, 2 to 10 percent slopes	77	IIe-2	12
Am	Alluvial land	77	VIw-1	17
AnB	Andover very stony loam, 0 to 8 percent slopes	78	VIIs-2	18
AoB	Andover gravelly silt loam, 2 to 8 percent slopes	78	IVw-1	16
As	Atkins and Melvin silt loams	78	IIIw-1	15
At	Atkins silty clay loam, clayey subsoil variant	80	IVw-2	16
BcB	Bedington channery loam, 3 to 8 percent slopes	80	IIe-2	12
BcC	Bedington channery loam, 8 to 15 percent slopes	80	IIIe-2	14
BdB	Bedington-Laidig complex, 2 to 8 percent slopes	81	IIIs-1	16
BdD	Bedington-Laidig complex, 8 to 25 percent slopes	81	IVs-2	17
BeB	Berks shaly silt loam, 2 to 8 percent slopes	81	IIe-6	13
BeC	Berks shaly silt loam, 8 to 15 percent slopes	81	IIIe-5	15
BlA	Blairton silt loam, 0 to 3 percent slopes	82	IIIw-2	15
BlB	Blairton silt loam, 3 to 8 percent slopes	82	IIIw-2	15
BrA	Brinkerton silt loam, 0 to 3 percent slopes	83	IVw-1	16
BrB	Brinkerton silt loam, 3 to 8 percent slopes	83	IVw-1	16
BuB	Buchanan gravelly loam, 2 to 8 percent slopes	84	IIe-5	13
BuC	Buchanan gravelly loam, 8 to 15 percent slopes	84	IIIe-4	14
BxB	Buchanan extremely stony loam, 0 to 8 percent slopes	84	VIIs-2	18
BxD	Buchanan extremely stony loam, 8 to 25 percent slopes	84	VIIs-2	18
Ck	Clarksburg silt loam	85	IIw-2	13
DeB	Dekalb and Hazleton extremely stony sandy loams, 0 to 8 percent slopes	85	VIIs-1	18
DeD	Dekalb and Hazleton extremely stony sandy loams, 8 to 25 percent slopes	85	VIIs-1	18
DlF	Dekalb and Lehew extremely stony soils, 25 to 75 percent slopes	85	VIIs-3	18
DsA	Duffield silt loam, 0 to 3 percent slopes	87	I-2	12
DsB	Duffield silt loam, 3 to 8 percent slopes	87	IIe-1	12
DsC	Duffield silt loam, 8 to 15 percent slopes	87	IIIe-1	13
DsC3	Duffield silt loam, 8 to 15 percent slopes, eroded	87	IVe-1	16
Du	Dunning silty clay loam	88	IVw-2	16
Dv	Dunning silt loam, overwash variant	88	IIw-1	13
EcB	Edgemont channery loam, 3 to 8 percent slopes	89	IIe-4	13
EcC	Edgemont channery loam, 8 to 20 percent slopes	89	IIIe-4	14
EdC	Edgemont extremely stony loam, 5 to 20 percent slopes	89	VIIs-1	18
EeB	Edom silty clay loam, 2 to 8 percent slopes	90	IIe-3	12
EeC	Edom silty clay loam, 8 to 15 percent slopes	90	IIIe-3	14
ElB	Edom silty clay loam, moderately well drained variant, 2 to 8 percent slopes	90	IIe-5	13
GlB	Glenville channery silt loam, 3 to 8 percent slopes	91	IIe-5	13
HeA	Hagerstown silt loam, 0 to 3 percent slopes	91	I-2	12
HeB	Hagerstown silt loam, 3 to 8 percent slopes	91	IIe-1	12
HeC	Hagerstown silt loam, 8 to 15 percent slopes	92	IIIe-1	13
HfB	Hagerstown silty clay loam, 2 to 8 percent slopes	92	IIe-3	12
HgB3	Hagerstown rocky silty clay loam, 3 to 8 percent slopes, eroded	92	IVs-1	17
HgC3	Hagerstown rocky silty clay loam, 8 to 15 percent slopes, eroded	92	IVs-1	17
HhC3	Hagerstown silty clay, 8 to 15 percent slopes, eroded	92	IIIe-3	14
HhD3	Hagerstown silty clay, 15 to 25 percent slopes, eroded	92	IVe-1	16
HkB	Hagerstown-Rock outcrop complex, 0 to 8 percent slopes	92	VIs-1	17
HkD	Hagerstown-Rock outcrop complex, 8 to 30 percent slopes	92	VIs-1	17
HlB	Highfield channery silt loam, 3 to 8 percent slopes	94	IIe-2	12
HlC	Highfield channery silt loam, 8 to 15 percent slopes	94	IIIe-2	14
HmD	Highfield extremely stony silt loam, 8 to 25 percent slopes	94	VIIs-1	18

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit Symbol	Capability unit Page
HmF	Highfield extremely stony silt loam, 25 to 70 percent slopes	94	VIIs-3	18
LaB	Laidig extremely stony sandy loam, 0 to 8 percent slopes	95	VIIs-1	18
LaD	Laidig extremely stony sandy loam, 8 to 25 percent slopes	95	VIIs-1	18
LaE	Laidig extremely stony sandy loam, 25 to 45 percent slopes	95	VIIs-3	18
LdB	Laidig gravelly loam, 3 to 8 percent slopes	95	IIe-2	12
LdC	Laidig gravelly loam, 8 to 15 percent slopes	95	IIIe-2	14
LeB	Leetonia extremely stony loamy sand, 0 to 12 percent slopes	96	VIIs-1	18
LhD	Lehew extremely stony loam, 8 to 25 percent slopes	96	VIIs-1	18
MaB	Markes shaly silt loam, 2 to 8 percent slopes	97	IVw-3	17
McD	Meckesville extremely stony loam, 8 to 25 percent slopes	97	VIIs-1	18
MoB	Monongahela silt loam, 3 to 8 percent slopes	99	IIe-5	13
MrB	Murrill gravelly sandy loam, 3 to 8 percent slopes	99	IIe-4	13
MrC	Murrill gravelly sandy loam, 8 to 15 percent slopes	99	IIIe-4	14
MuB	Murrill cobbly sandy loam, 3 to 8 percent slopes	99	IIIs-1	16
MuC	Murrill cobbly sandy loam, 8 to 15 percent slopes	100	IVs-2	17
MvB	Murrill extremely stony sandy loam, 0 to 8 percent slopes	100	VIIs-1	18
MvD	Murrill extremely stony sandy loam, 8 to 25 percent slopes	100	VIIs-1	18
MwA	Murrill gravelly loam, 0 to 3 percent slopes	100	I-2	12
MwB	Murrill gravelly loam, 3 to 8 percent slopes	101	IIe-1	12
MwC	Murrill gravelly loam, 8 to 15 percent slopes	101	IIIe-1	13
No	Nolin silt loam, local alluvium	101	I-1	12
Pe	Penlaw silt loam	102	IIIw-2	15
Ph	Philo silt loam	102	IIw-1	13
Po	Pope soils	103	I-1	12
Pu	Purdy silty clay loam	103	IVw-1	16
RyB	Ryder silt loam, 3 to 8 percent slopes	104	IIe-1	12
RyC	Ryder silt loam, 8 to 15 percent slopes	104	IIIe-1	13
RyD	Ryder silt loam, 15 to 25 percent slopes	104	IVe-1	16
Ty	Tyler silt loam	105	IIIw-2	15
Ur	Urban land	105	------	----
VaD	Vanderlip cobbly loamy sand, 0 to 25 percent slopes	106	VIIs-1	18
VaE	Vanderlip cobbly loamy sand, 25 to 50 percent slopes	106	VIIs-3	18
Vd	Very stony land, Dekalb soil material	106	VIIIs-1	19
Wa	Warners silt loam	106	IIIw-1	15
WeB	Weikert shaly silt loam, 2 to 8 percent slopes	107	IIIe-6	15
WeC	Weikert shaly silt loam, 8 to 15 percent slopes	107	IVe-2	16
WeD	Weikert shaly silt loam, 15 to 25 percent slopes	107	VIe-1	17
WeF	Weikert shaly silt loam, 25 to 70 percent slopes	107	VIIe-1	18
WkB3	Weikert very shaly silt loam, 3 to 8 percent slopes, eroded	107	IVe-2	16
WkC3	Weikert very shaly silt loam, 8 to 15 percent slopes, eroded	107	VIe-1	17
WkD3	Weikert very shaly silt loam, 15 to 25 percent slopes, eroded	107	VIIe-1	18

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PENNSYLVANIA STATE UNIVERSITY, COLLEGE OF AGRICULTURE
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
STATE CONSERVATION COMMISSION

GENERAL SOIL MAP
FRANKLIN COUNTY, PENNSYLVANIA

Scale 1:253,440
1 0 1 2 3 4 Miles

SOIL ASSOCIATIONS

1 — Laidig-Very stony land-Buchanan association: Deep, well drained to somewhat poorly drained, nearly level to very steep soils formed in colluvium from sandstone, and Very stony land; on tops and sides of mountains

2 — Hagerstown-Duffield association: Deep, well-drained, nearly level to steep soils formed in materials weathered from limestone; in valleys

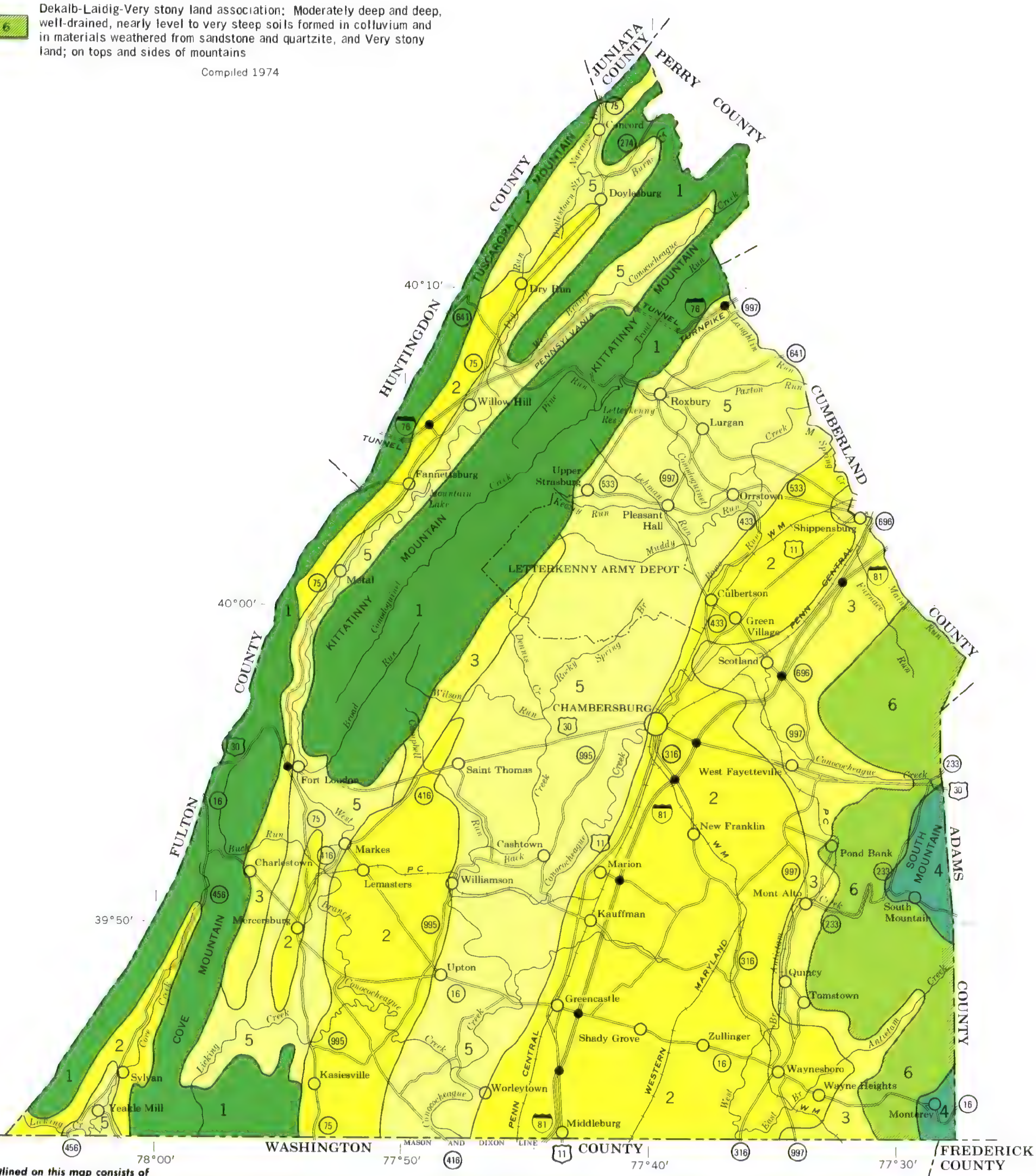
3 — Murrill-Laidig association: Deep, well-drained, gently sloping to moderately steep soils formed in colluvium; on mountain foot slopes

4 — Highfield-Glenville association: Deep, well-drained to somewhat poorly drained, gently sloping to very steep soils formed in materials weathered from metabasalt, rocks containing mica, and metarhyolite; on tops and sides of mountains

5 — Weikert-Berks-Bedington association: Shallow to deep, well-drained, nearly level to very steep soils formed in materials weathered from shale and interbedded shale, siltstone, and sandstone; in valleys

6 — Dekalb-Laidig-Very stony land association: Moderately deep and deep, well-drained, nearly level to very steep soils formed in colluvium and in materials weathered from sandstone and quartzite, and Very stony land; on tops and sides of mountains

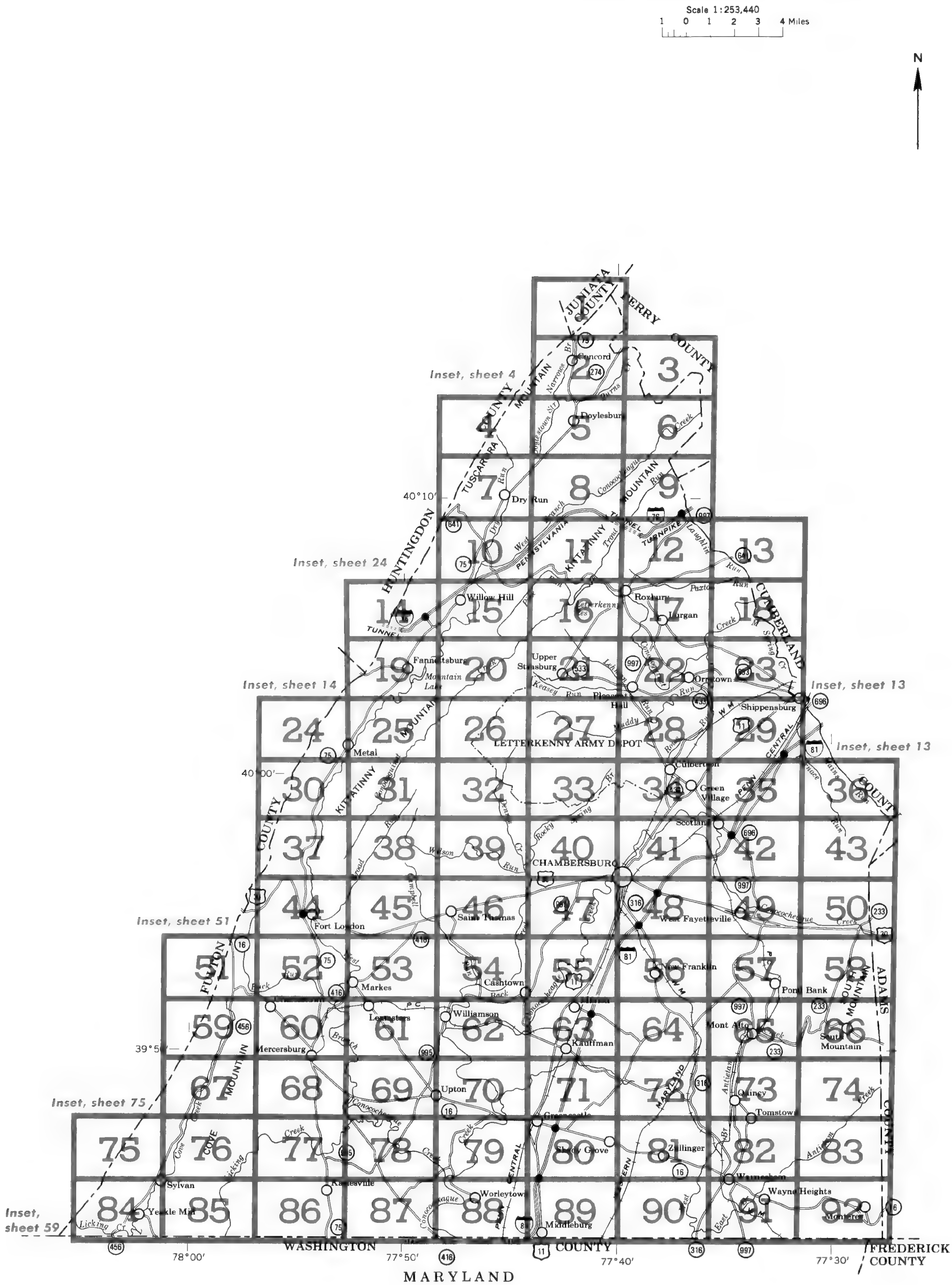
Compiled 1974



Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

INDEX TO MAP SHEETS
FRANKLIN COUNTY, PENNSYLVANIA

Scale 1:253,440



SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the class of slope. Most symbols without a slope letter are those of nearly level soils, but some are for land types that have a considerable range of slope. A final number, 3, in a symbol indicates that the soil is eroded.

SYMBOL	NAME
AlB	Allegheny loam, 2 to 10 percent slopes
Am	Alluvial land
AnB	Andover very stony loam, 0 to 8 percent slopes
AoB	Andover gravelly silt loam, 2 to 8 percent slopes
As	Atkins and Melvin silt loams
At	Atkins silty clay loam, clayey subsoil variant
BcB	Bedington channery loam, 3 to 8 percent slopes
BcC	Bedington channery loam, 8 to 15 percent slopes
BdB	Bedington-Laidig complex, 2 to 8 percent slopes
BdD	Bedington-Laidig complex, 8 to 25 percent slopes
BeB	Berks shaly silt loam, 2 to 8 percent slopes
BeC	Berks shaly silt loam, 8 to 15 percent slopes
BlA	Blairton silt loam, 0 to 3 percent slopes
BlB	Blairton silt loam, 3 to 8 percent slopes
BrA	Brinkerton silt loam, 0 to 3 percent slopes
BrB	Brinkerton silt loam, 3 to 8 percent slopes
BuB	Buchanan gravelly loam, 2 to 8 percent slopes
BuC	Buchanan gravelly loam, 8 to 15 percent slopes
BxB	Buchanan extremely stony loam, 0 to 8 percent slopes
BxD	Buchanan extremely stony loam, 8 to 25 percent slopes
Cx	Clarksburg silt loam
DeB	Dekalb and Hazleton extremely stony sandy loams, 0 to 8 percent slopes
DeD	Dekalb and Hazleton extremely stony sandy loams, 8 to 25 percent slopes
DlF	Dekalb and Lehew extremely stony soils, 25 to 75 percent slopes
DsA	Duffield silt loam, 0 to 3 percent slopes
DsB	Duffield silt loam, 3 to 8 percent slopes
DsC	Duffield silt loam, 8 to 15 percent slopes
DsC3	Duffield silt loam, 8 to 15 percent slopes, eroded
Du	Dunning silty clay loam
Dv	Dunning silt loam, overwash variant

SYMBOL	NAME
EcB	Edgemont channery loam, 3 to 8 percent slopes
EcC	Edgemont channery loam, 8 to 20 percent slopes
EdC	Edgemont extremely stony loam, 5 to 20 percent slopes
EeB	Edom silty clay loam, 2 to 8 percent slopes
EeC	Edom silty clay loam, 8 to 15 percent slopes
ElB	Edom silty clay loam, moderately well drained variant, 2 to 8 percent slopes
GlB	Glenville channery silt loam, 3 to 8 percent slopes
HeA	Hagerstown silt loam, 0 to 3 percent slopes
HeB	Hagerstown silt loam, 3 to 8 percent slopes
HeC	Hagerstown silt loam, 8 to 15 percent slopes
HfB	Hagerstown silty clay loam, 2 to 8 percent slopes
HgB3	Hagerstown rocky silty clay loam, 3 to 8 percent slopes, eroded
HgC3	Hagerstown rocky silty clay loam, 8 to 15 percent slopes, eroded
HhC3	Hagerstown silty clay, 8 to 15 percent slopes, eroded
HhD3	Hagerstown silty clay, 15 to 25 percent slopes, eroded
HkB	Hagerstown-Rock outcrop complex, 0 to 8 percent slopes
HkD	Hagerstown-Rock outcrop complex, 8 to 30 percent slopes
HlB	Highfield channery silt loam, 3 to 8 percent slopes
HlC	Highfield channery silt loam, 8 to 15 percent slopes
HmD	Highfield extremely stony silt loam, 8 to 25 percent slopes
HmF	Highfield extremely stony silt loam, 25 to 70 percent slopes
LaB	Laidig extremely stony sandy loam, 0 to 8 percent slopes
LaD	Laidig extremely stony sandy loam, 8 to 25 percent slopes
LaE	Laidig extremely stony sandy loam, 25 to 45 percent slopes
LcB	Laidig gravelly loam, 3 to 8 percent slopes
LcC	Laidig gravelly loam, 8 to 15 percent slopes
LeB	Leetonia extremely stony loamy sand, 0 to 12 percent slopes
LhD	Lehew extremely stony loam, 8 to 25 percent slopes
MaB	Markes shaly silt loam, 2 to 8 percent slopes
McD	Meckesville extremely stony loam, 8 to 25 percent slopes
MoB	Monongahela silt loam, 3 to 8 percent slopes
MrB	Murrill gravelly sandy loam, 3 to 8 percent slopes

SYMBOL	NAME
MrC	Murrill gravelly sandy loam, 8 to 15 percent slopes
MuB	Murrill cobbly sandy loam, 3 to 8 percent slopes
MuC	Murrill cobbly sandy loam, 8 to 15 percent slopes
MvB	Murrill extremely stony sandy loam, 0 to 8 percent slopes
MvD	Murrill extremely stony sandy loam, 8 to 25 percent slopes
MwA	Murrill gravelly loam, 0 to 3 percent slopes
MwB	Murrill gravelly loam, 3 to 8 percent slopes
MwC	Murrill gravelly loam, 8 to 15 percent slopes
No	Nolin silt loam, local alluvium
Pe	Penlow silt loam
Pn	Philo silt loam
Po	Pope soils
Pu	Purdy silty clay loam
RyB	Ryder silt loam, 3 to 8 percent slopes
RyC	Ryder silt loam, 8 to 15 percent slopes
RyD	Ryder silt loam, 15 to 25 percent slopes
Ty	Tyler silt loam
Ur	Urban land
VaD	Vanderlip cobbly loamy sand, 0 to 25 percent slopes
VaE	Vanderlip cobbly loamy sand, 25 to 50 percent slopes
Vd	Very stony land, Dekalb soil material
Wa	Warners silt loam
WeB	Weikert shaly silt loam, 2 to 8 percent slopes
WeC	Weikert shaly silt loam, 8 to 15 percent slopes
WeD	Weikert shaly silt loam, 15 to 25 percent slopes
WeF	Weikert shaly silt loam, 25 to 70 percent slopes
WkB3	Weikert very shaly silt loam, 3 to 8 percent slopes, eroded
WkC3	Weikert very shaly silt loam, 8 to 15 percent slopes, eroded
WkD3	Weikert very shaly silt loam, 15 to 25 percent slopes, eroded

FRANKLIN COUNTY, PENNSYLVANIA NO. 1

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

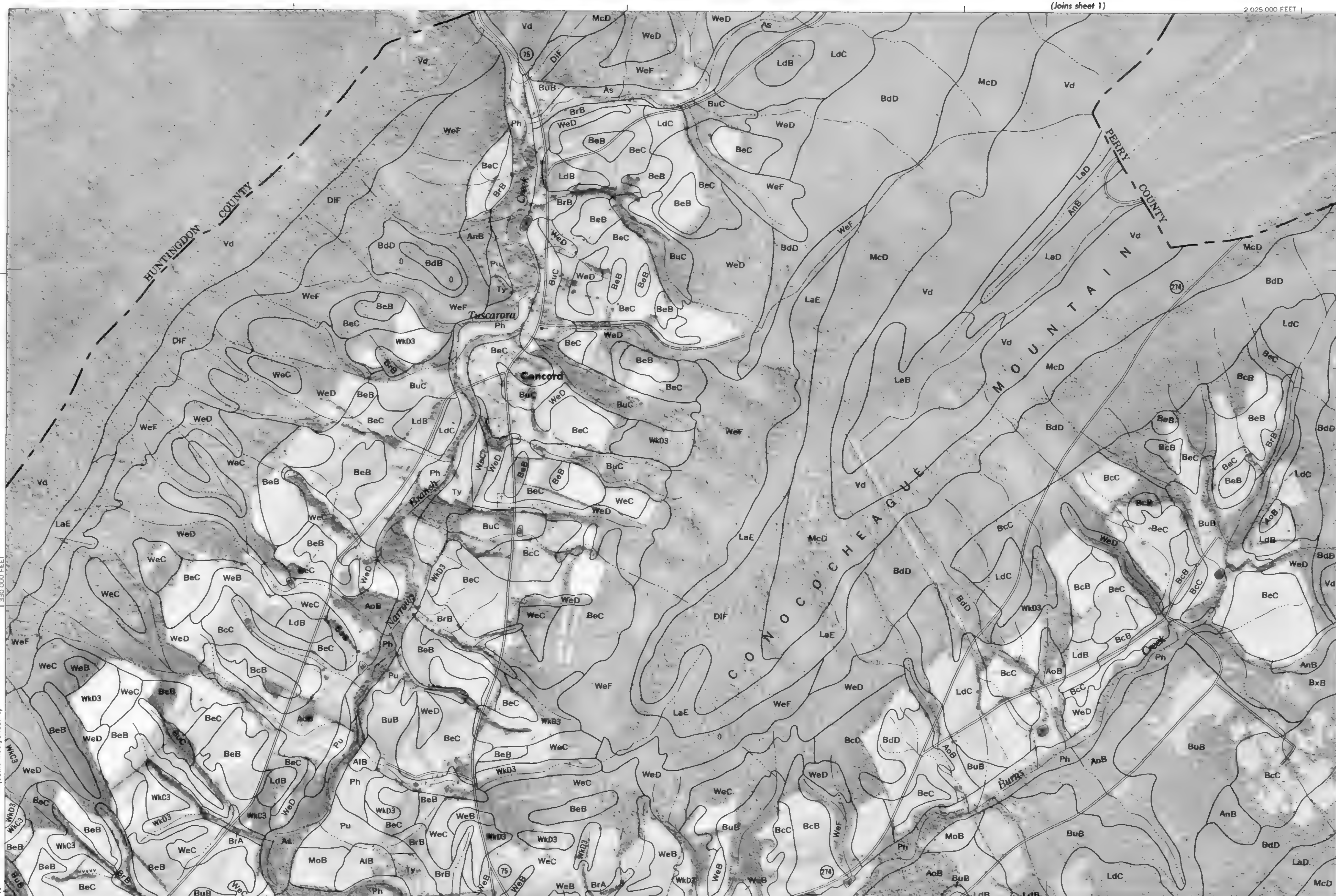
(Joins sheet 2)

N

Scale 1:15 840

1 Mile

5000 Feet



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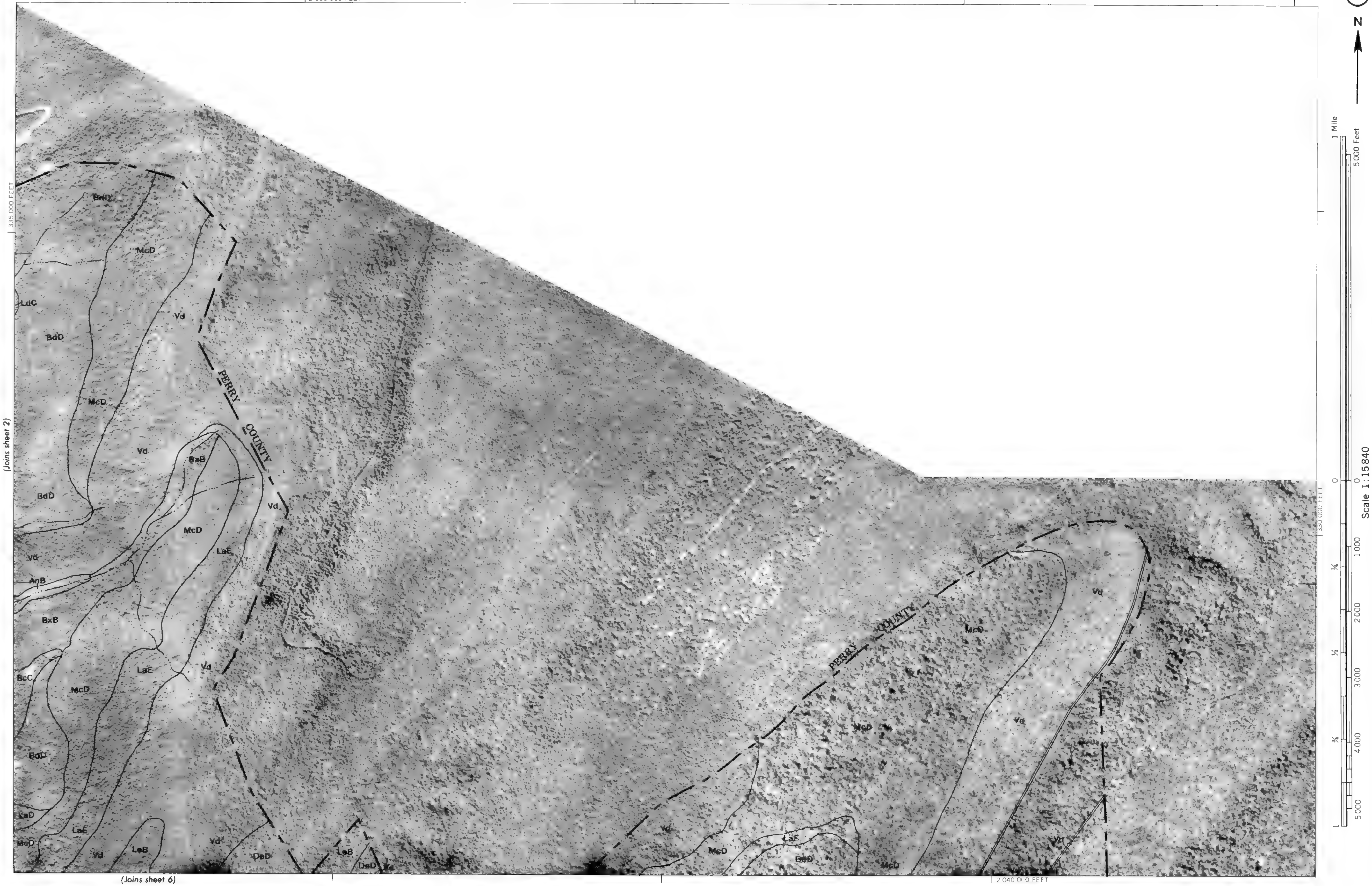
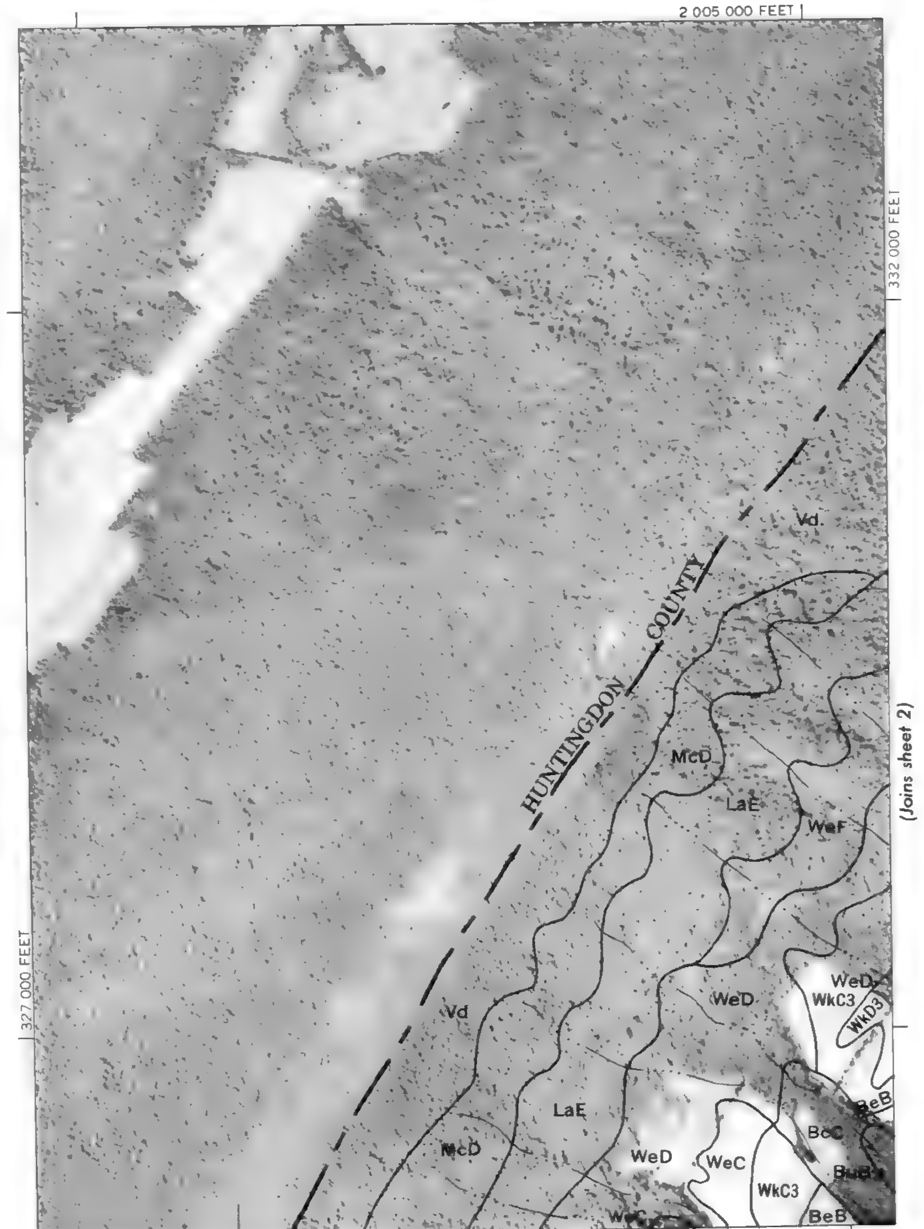
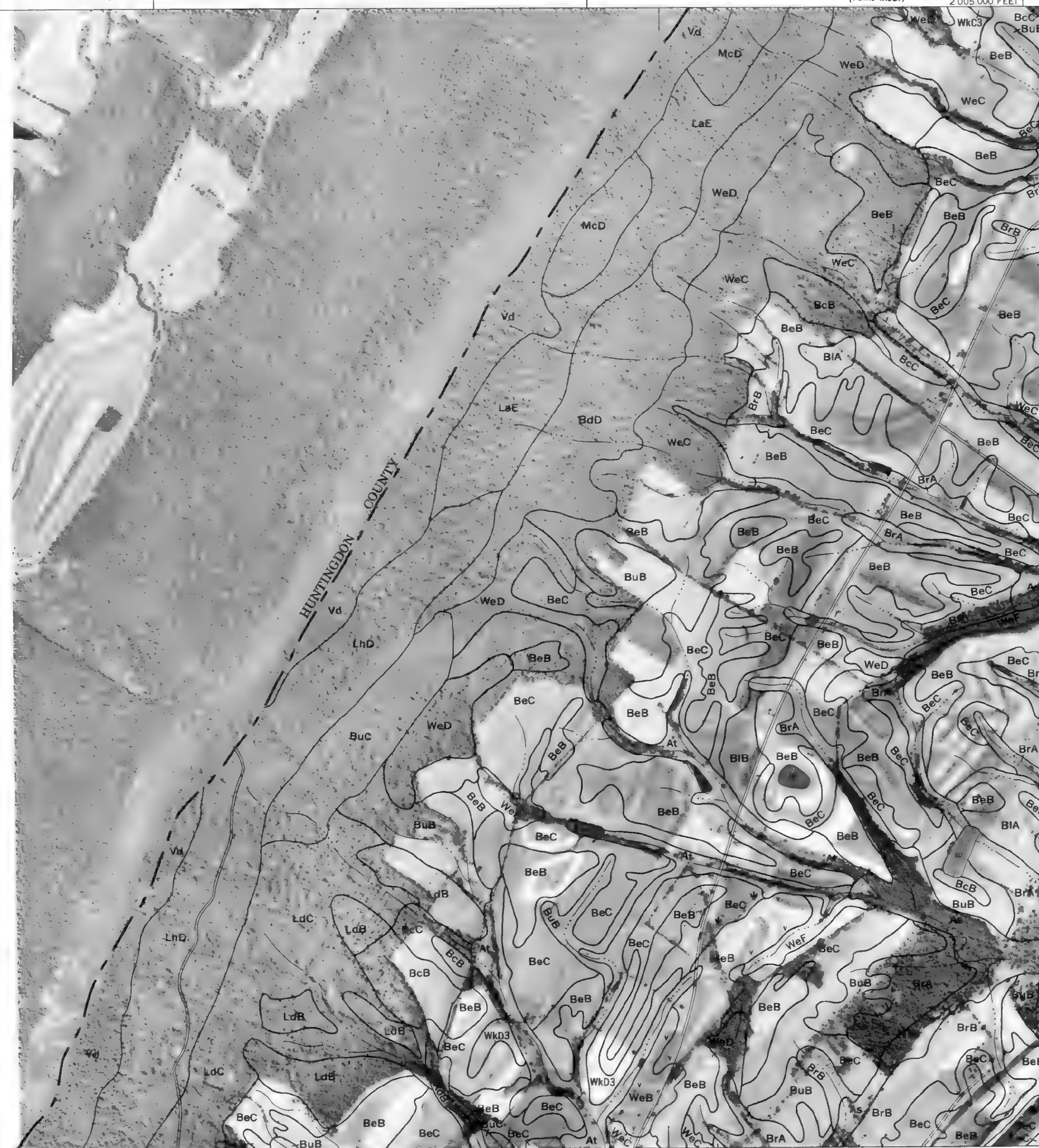


④

N

1 Mile
5000 Feet
Scale 1:15840
0 ¼ ½ ¾ 1
0 1000 2000 3000 4000 5000





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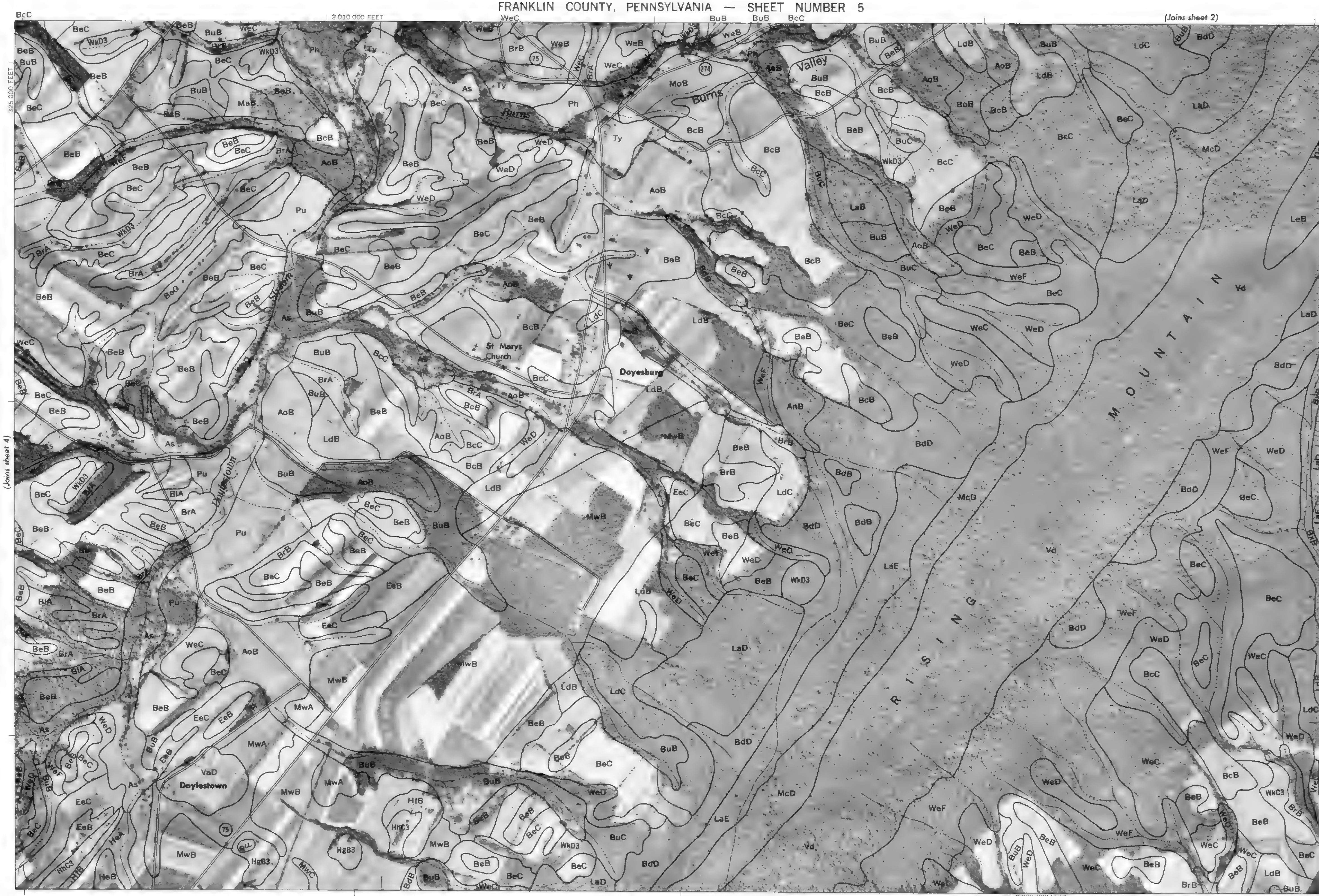

5

FRANKLIN COUNTY, PENNSYLVANIA NO. 5

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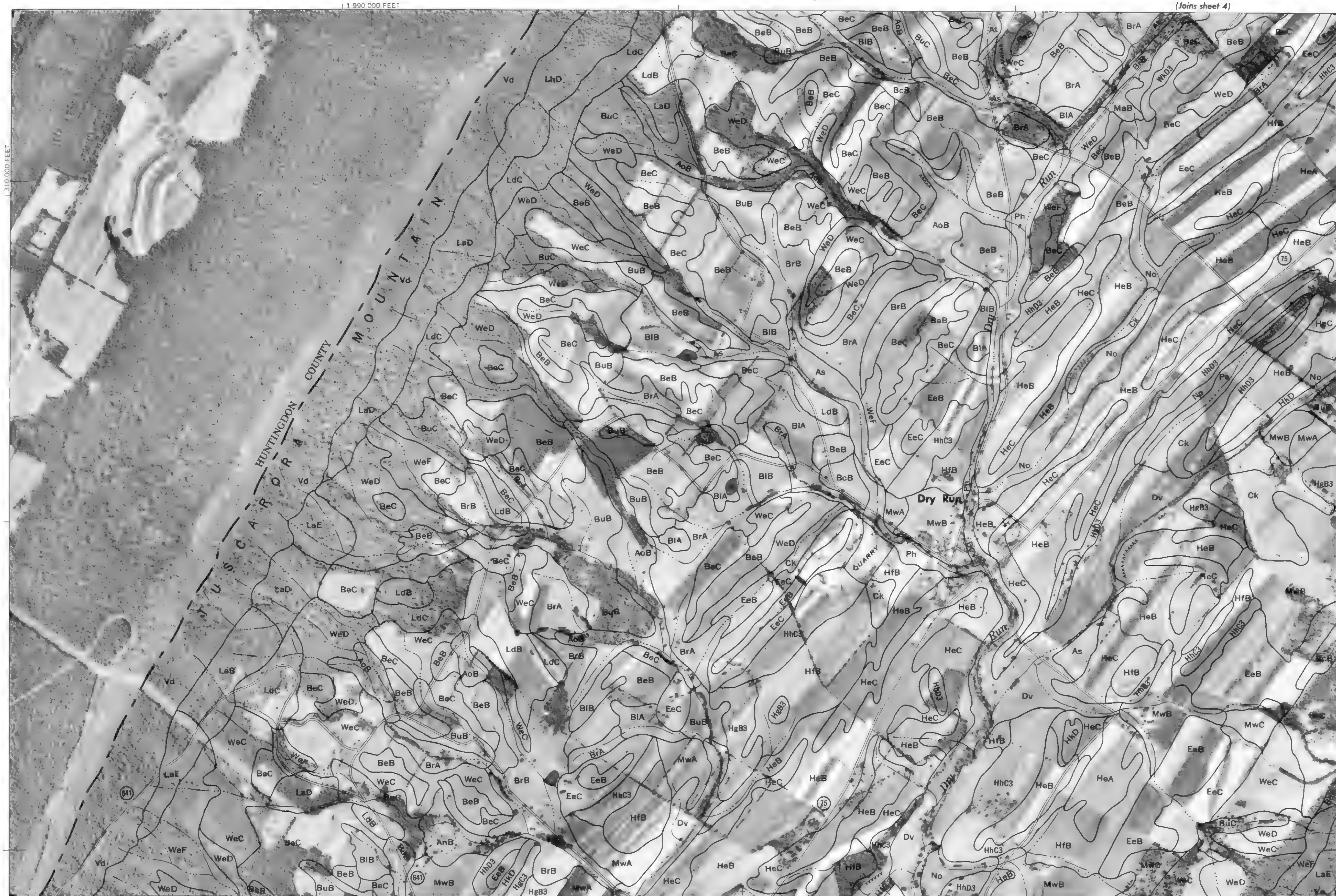

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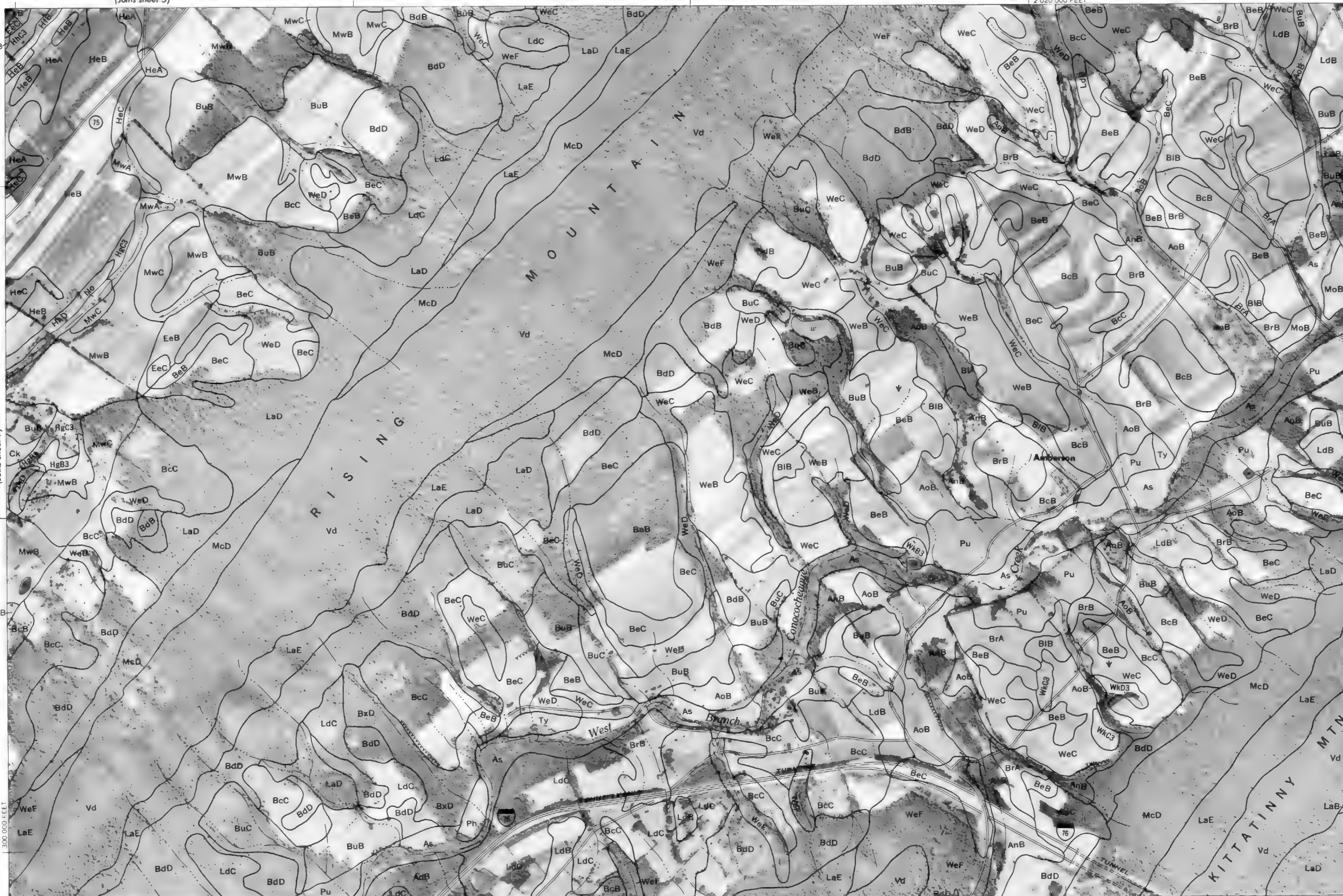
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

(Joins sheet 5)



N

Scale 1:15840

1 Mile

5000 Feet

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission

9

N

1 Mile
5000 Feet
Scale 1:15840

FRANKLIN COUNTY, PENNSYLVANIA NO. 9

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

(Joins sheet 7)

N

(Joins inset, sheet 24)

(Joins sheet 11)

(Joins sheet 15)

1 Mile

5000 Feet

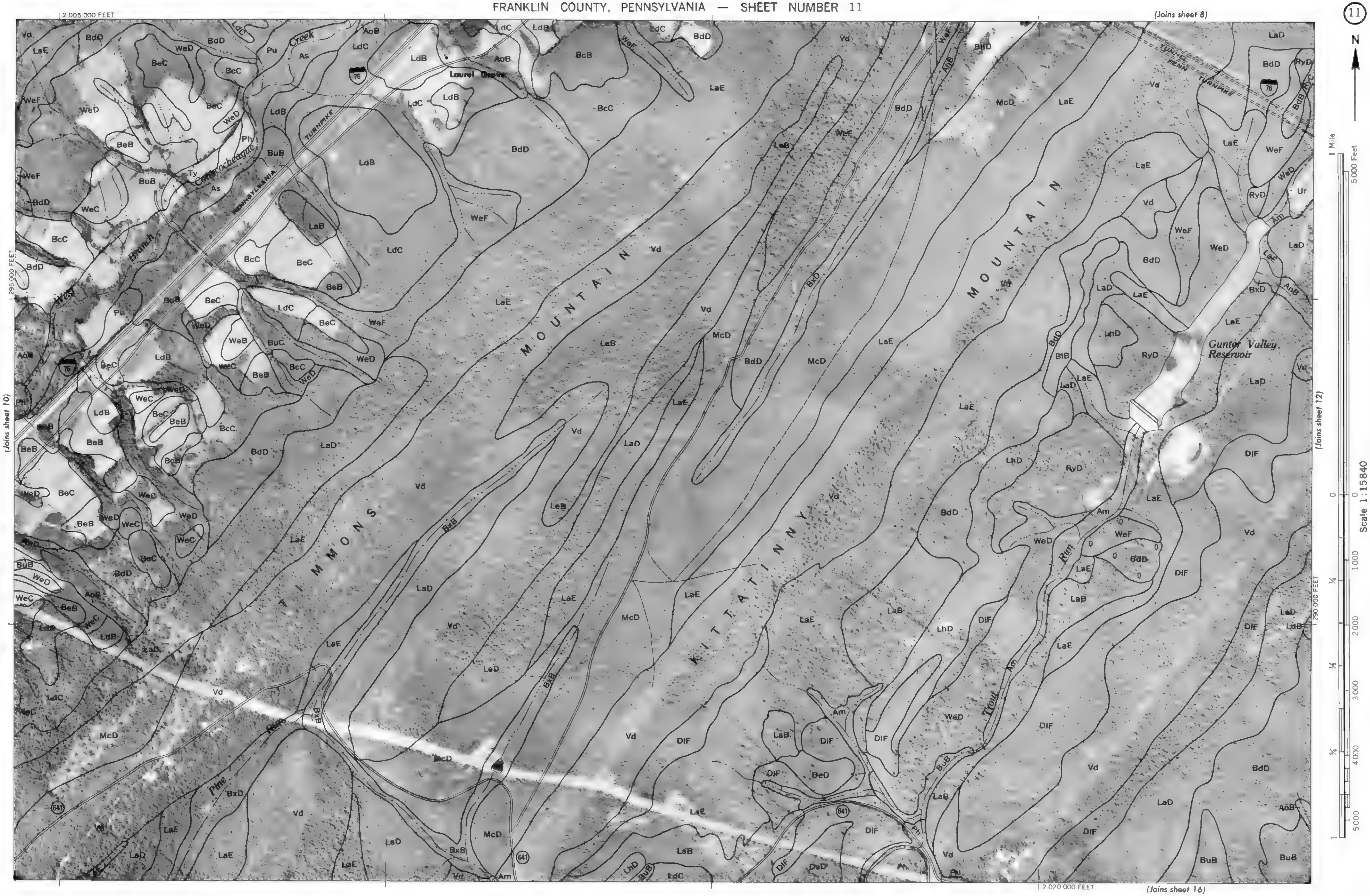
Scale 1:15840

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.



FRANKLIN COUNTY, PENNSYLVANIA NO. 11

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

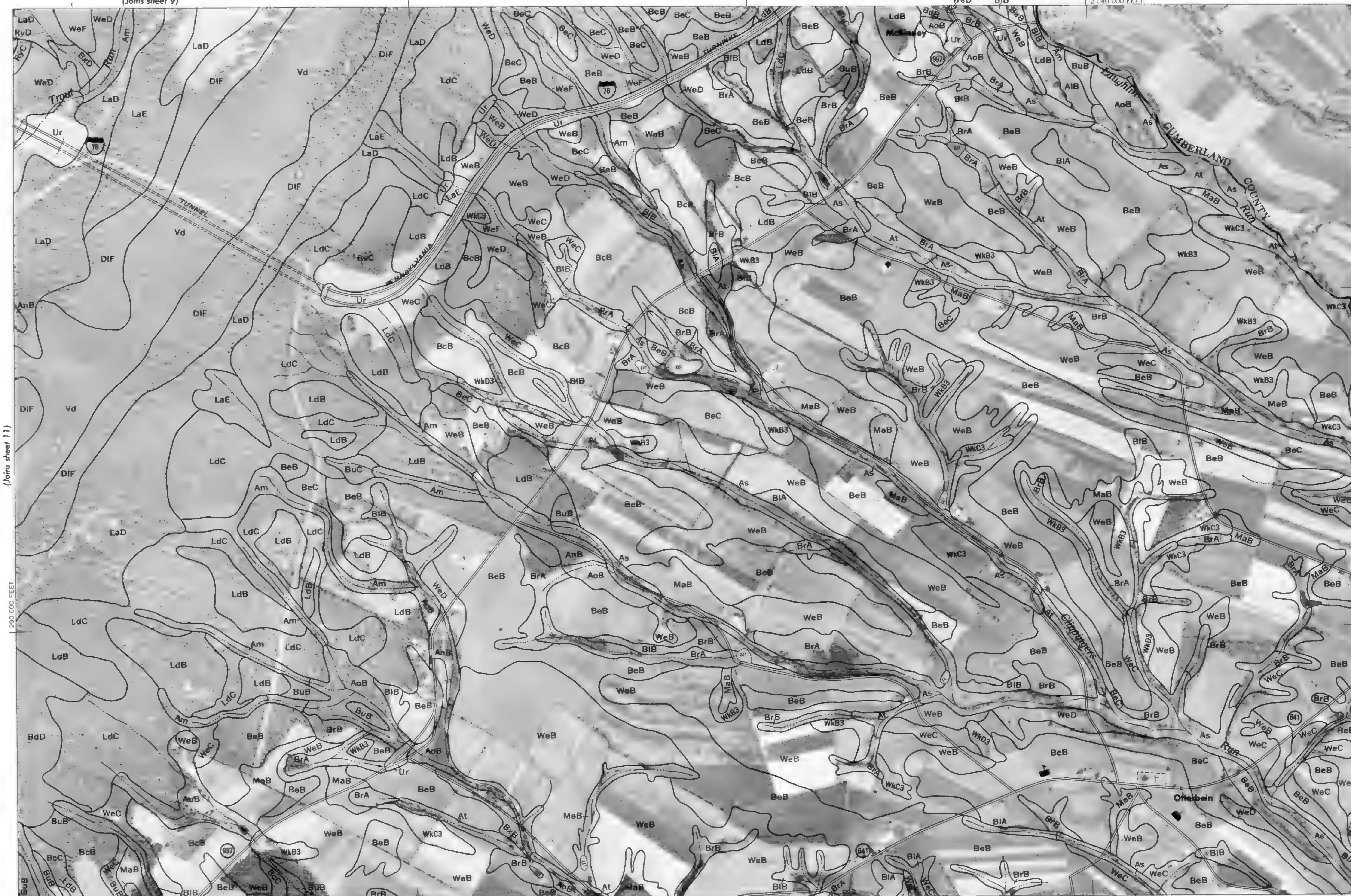
Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

(12)

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 12

(Joins sheet 9)

N



(Joins sheet 11)

(Joins sheet 13)

(Joins sheet 17)

1 Mile

5000 Feet

Scale 1:15840

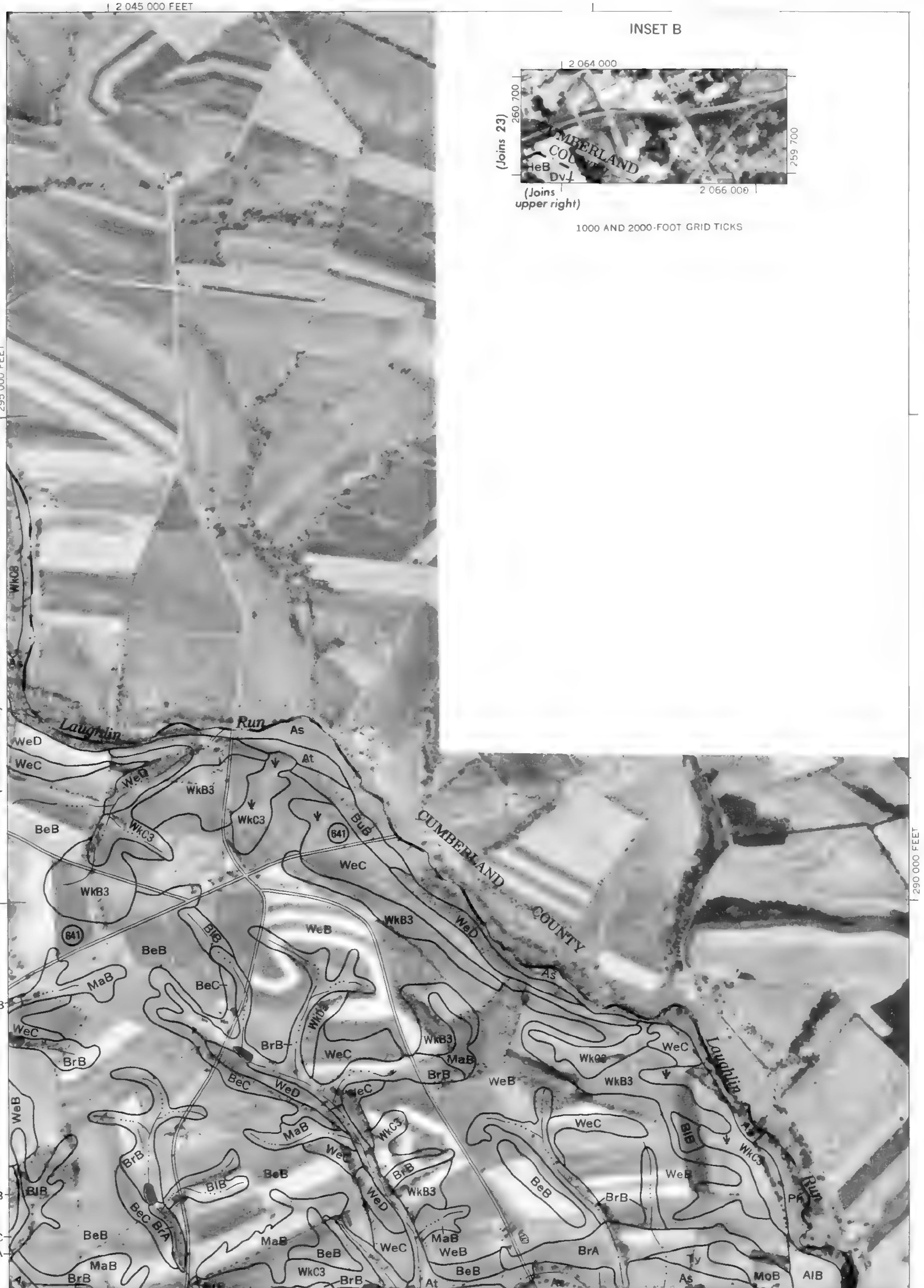
0 1000 2000 3000 4000 5000

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 12

13



N

1 Mile

5 000 Feet

Scale 1:15840

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

FRANKLIN COUNTY, PENNSYLVANIA NO. 13

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 14

N

Scale 1:15840

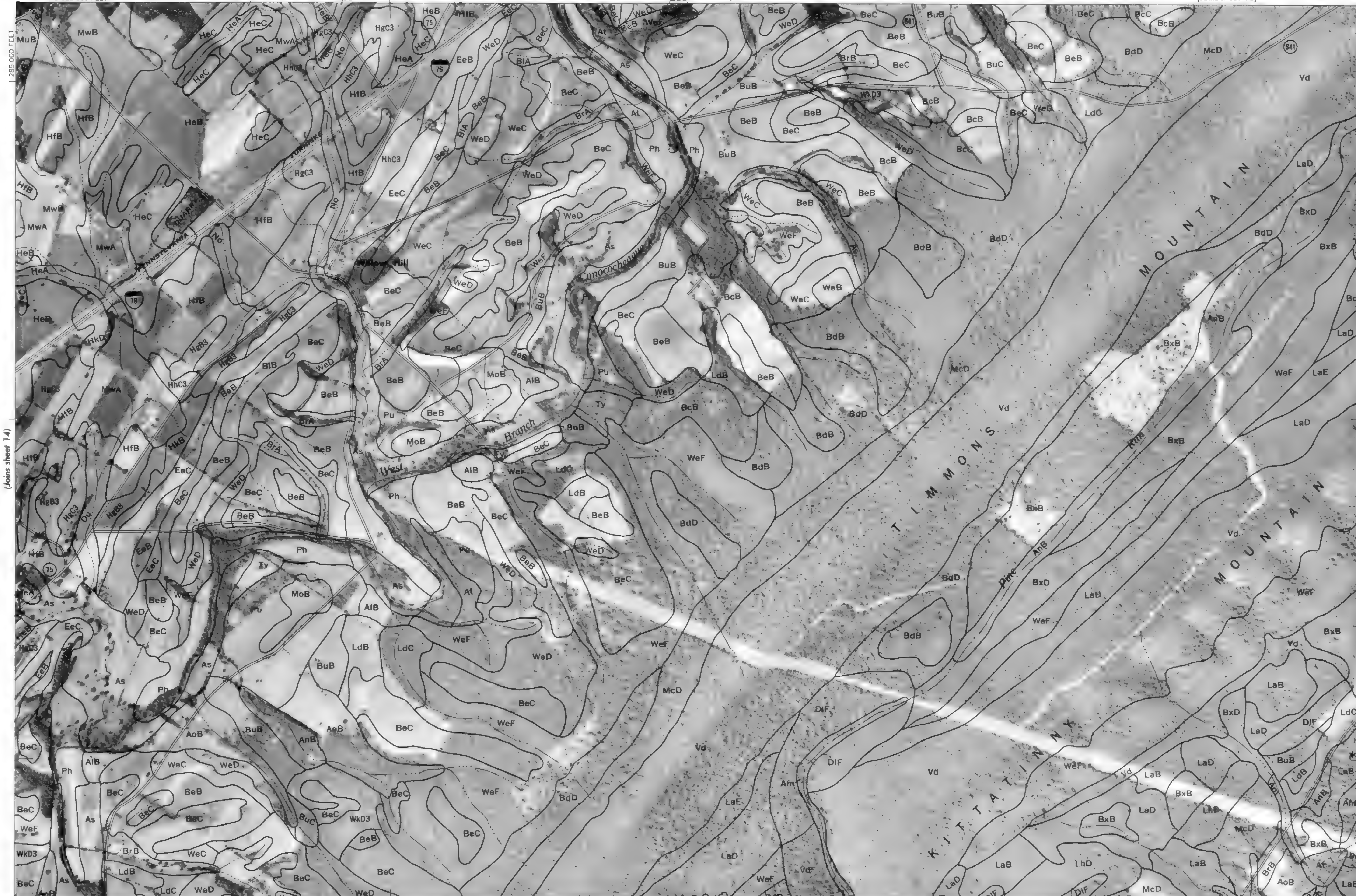
1 Mile — ¾ — ½ — ¼ — 0

5000 Feet — 4000 — 3000 — 2000 — 1000 — 0

3000 AND 4000-FOOT GRID TICKS

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.



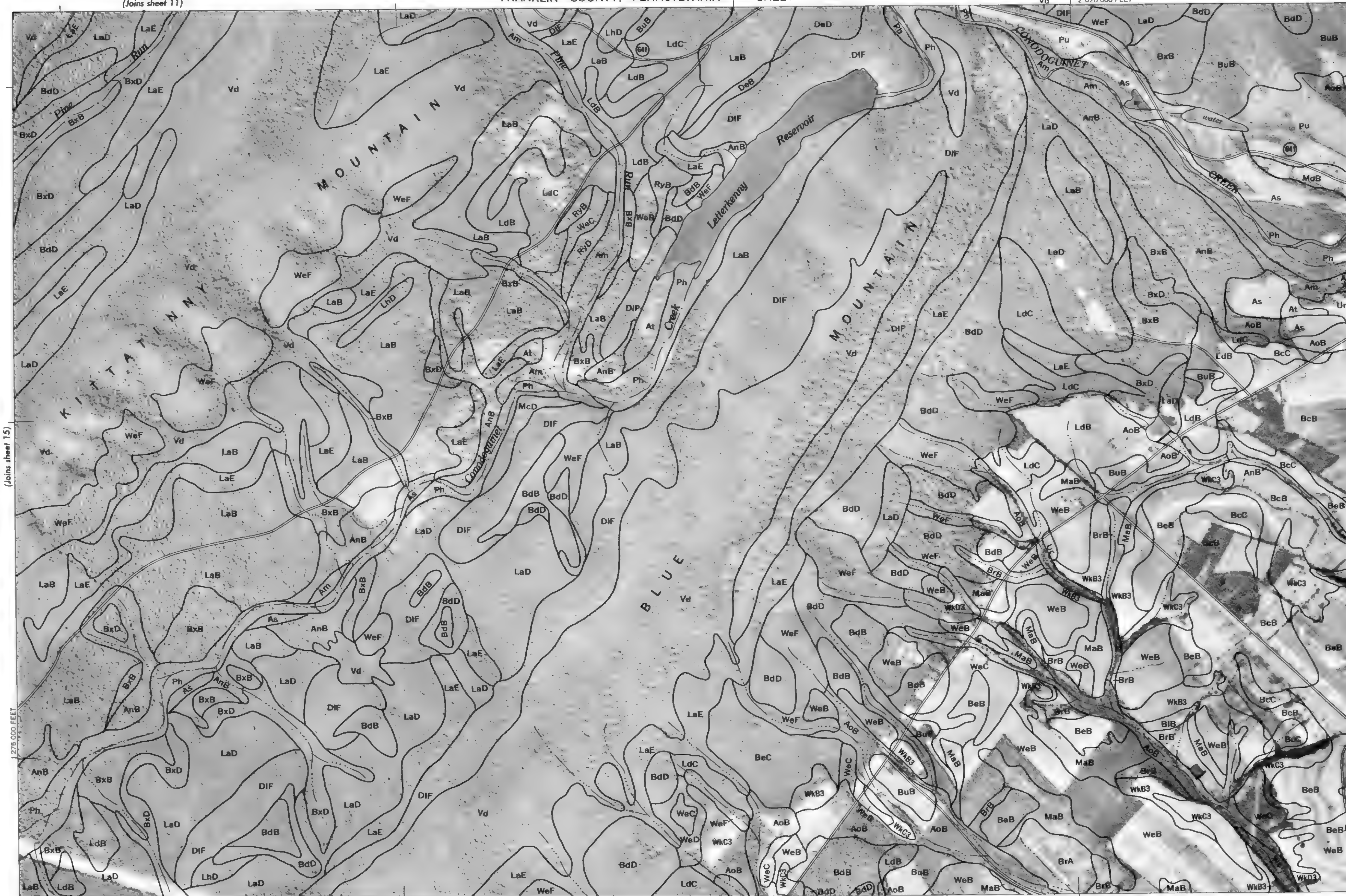
FRANKLIN COUNTY, PENNSYLVANIA NO. 15

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 16

(Joins sheet 11)

N



(Joins sheet 15)

(Joins sheet 17)

(Joins sheet 21)

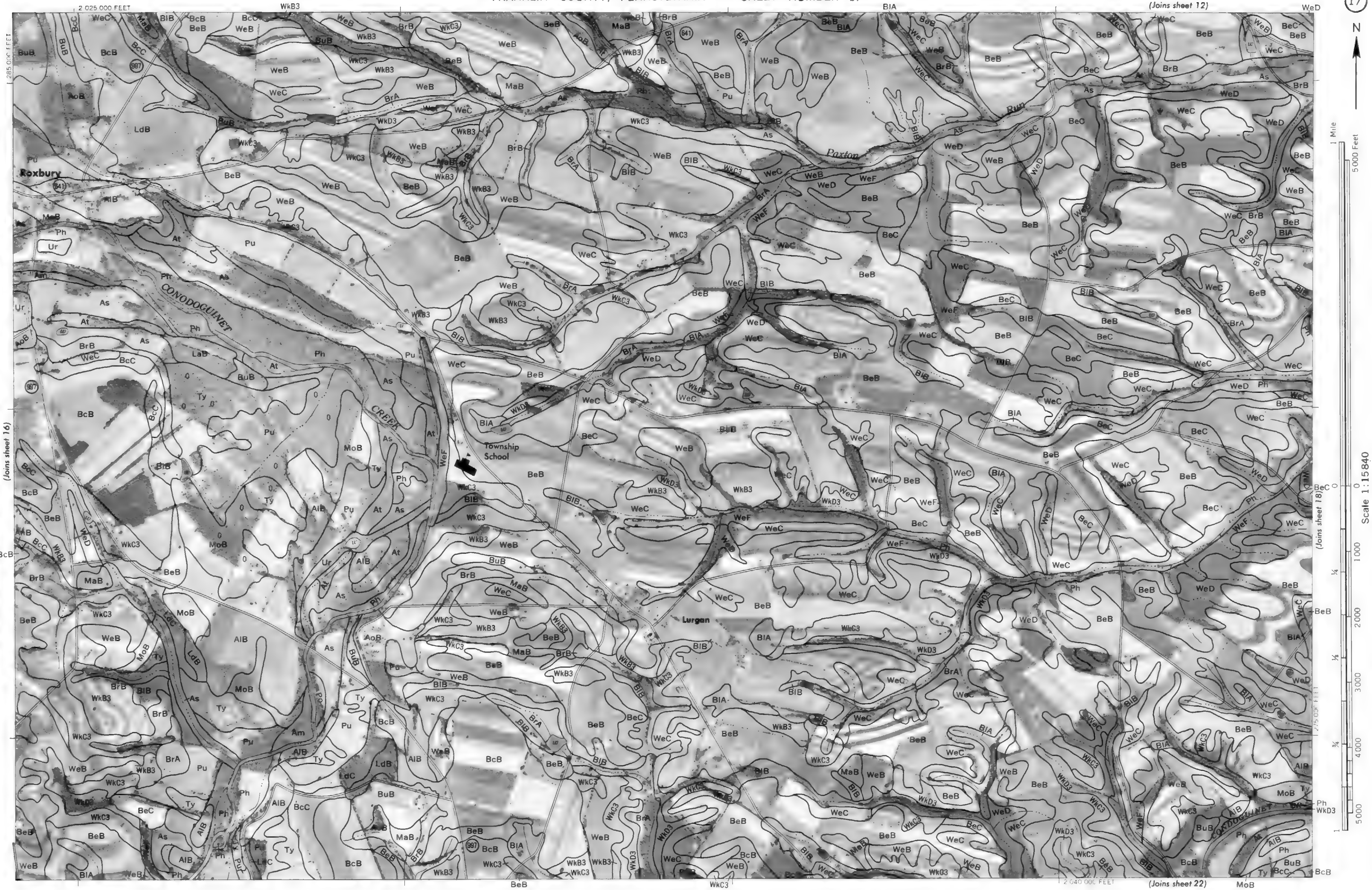
Scale 1:15840

1 Mile | 5000 Feet

0 | 1000 | 2000 | 3000 | 4000 | 5000

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

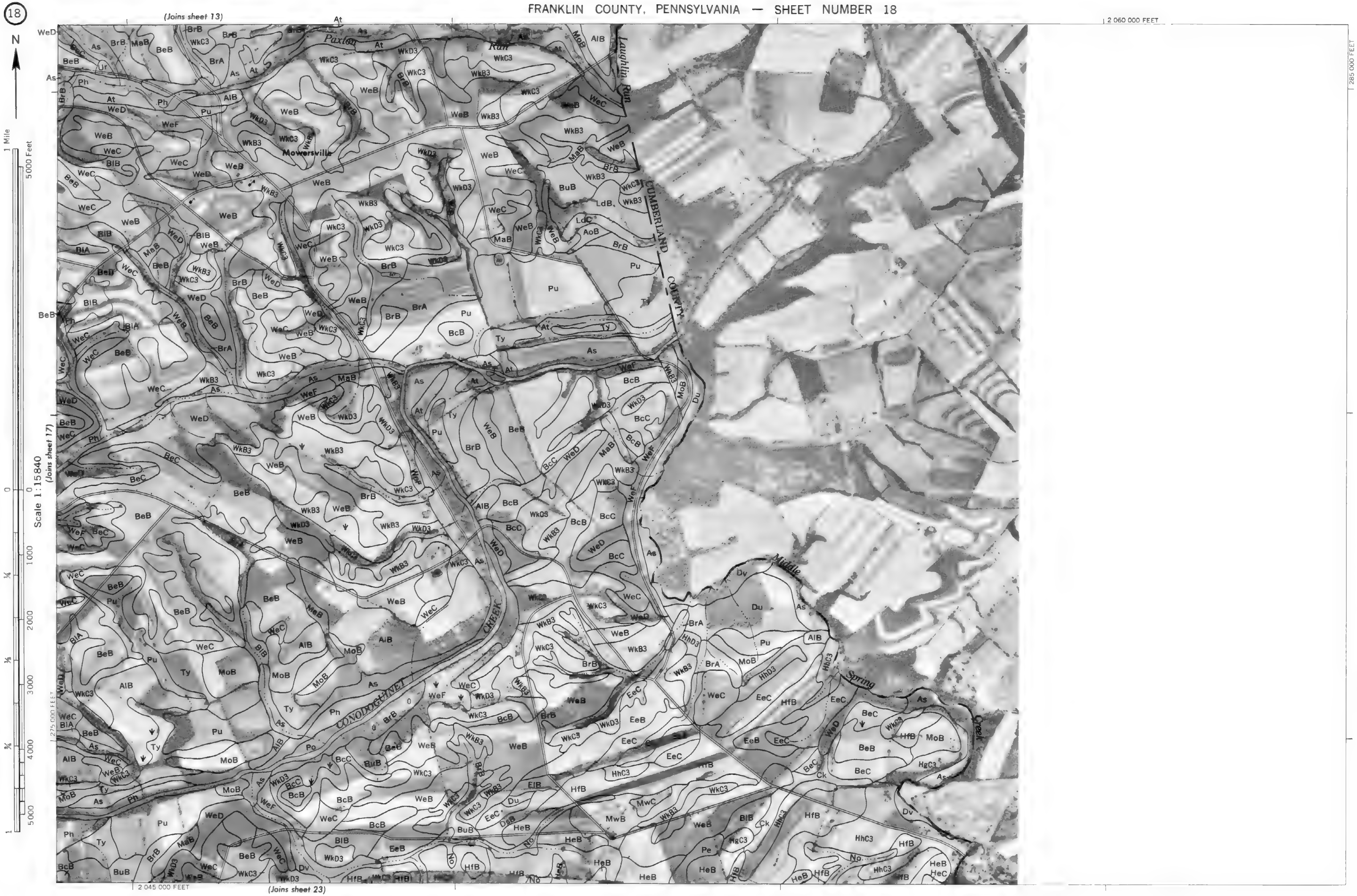


FRANKLIN COUNTY, PENNSYLVANIA NO. 17

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

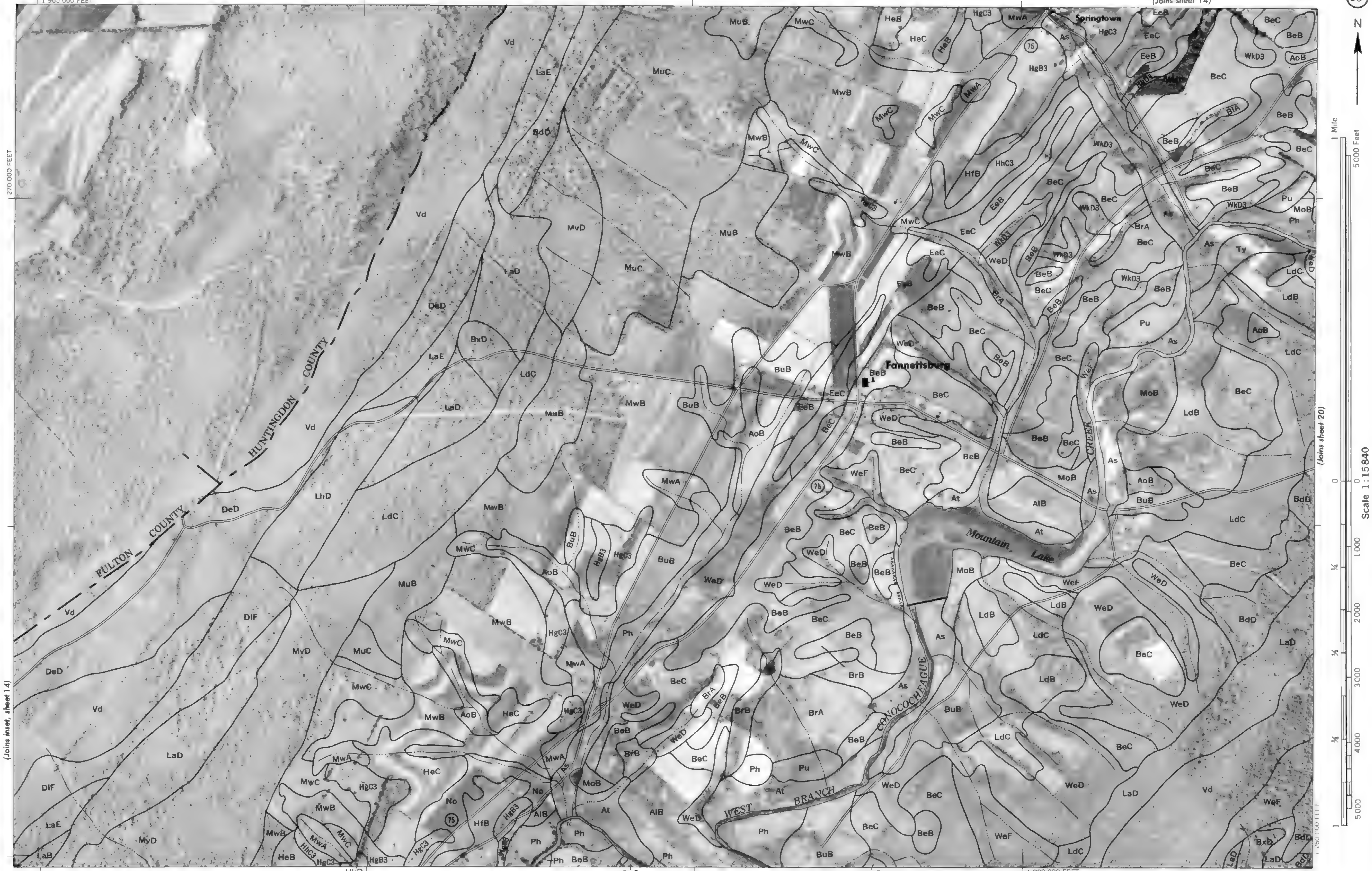
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 18



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

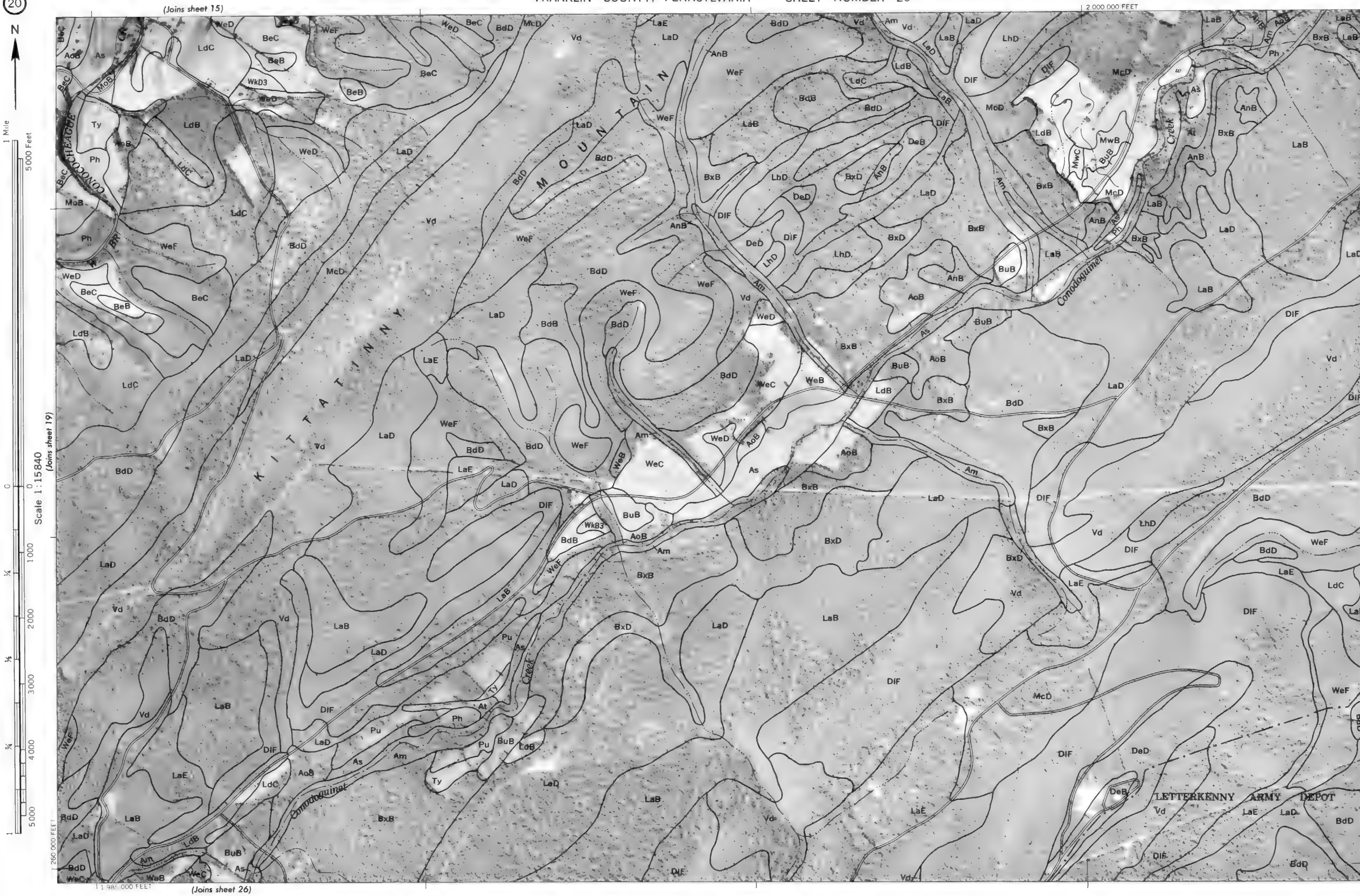


FRANKLIN COUNTY, PENNSYLVANIA NO 19

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 20



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 20

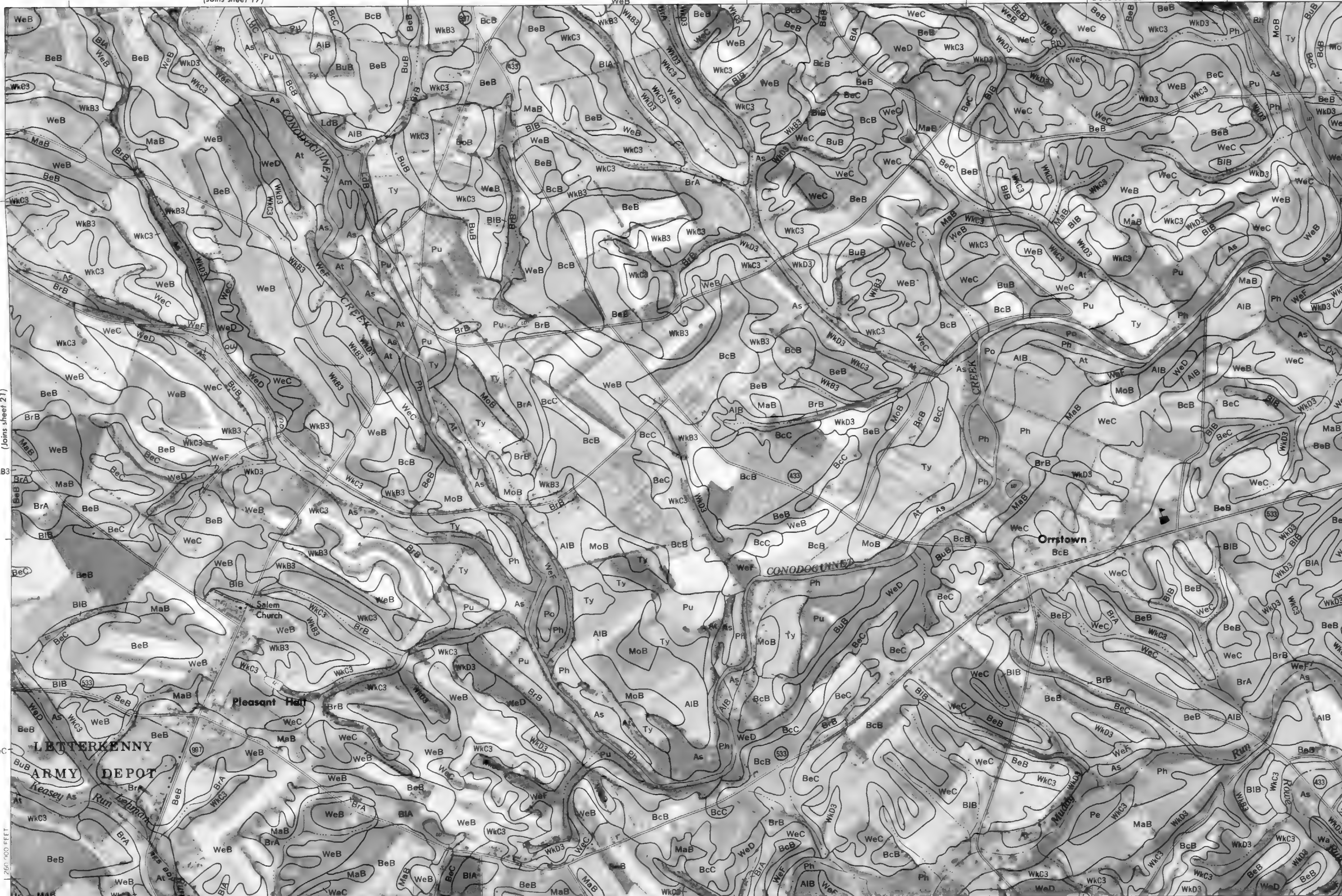
FRANKLIN COUNTY, PENNSYLVANIA NO 21

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

22

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 22

(Joins sheet 17)



(Joins sheet 21)

(Joins sheet 23)

(Joins sheet 28)

N

Scale 1:15 840

1 Mile

5000 Feet

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

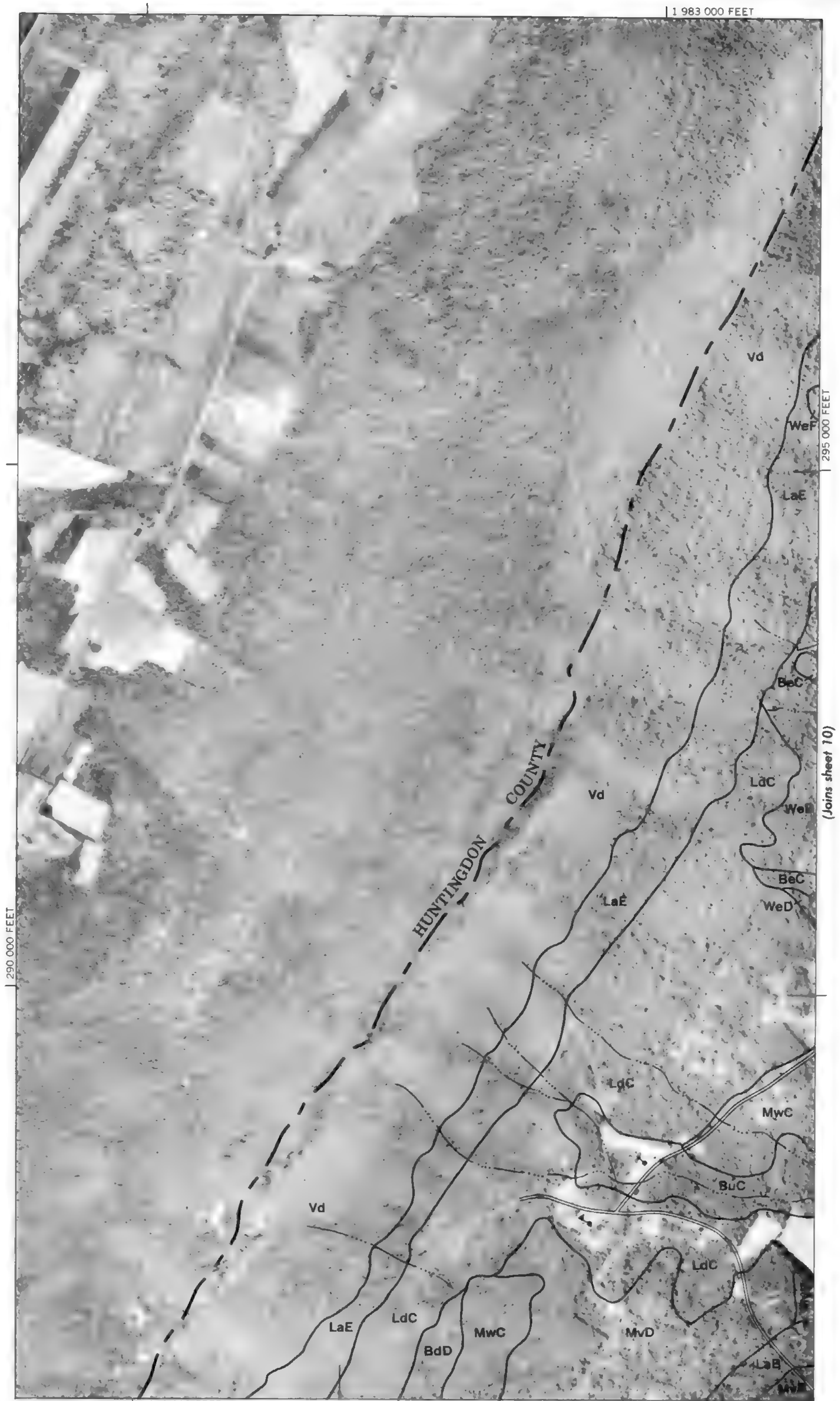
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 22

FRANKLIN COUNTY, PENNSYLVANIA NO. 23

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

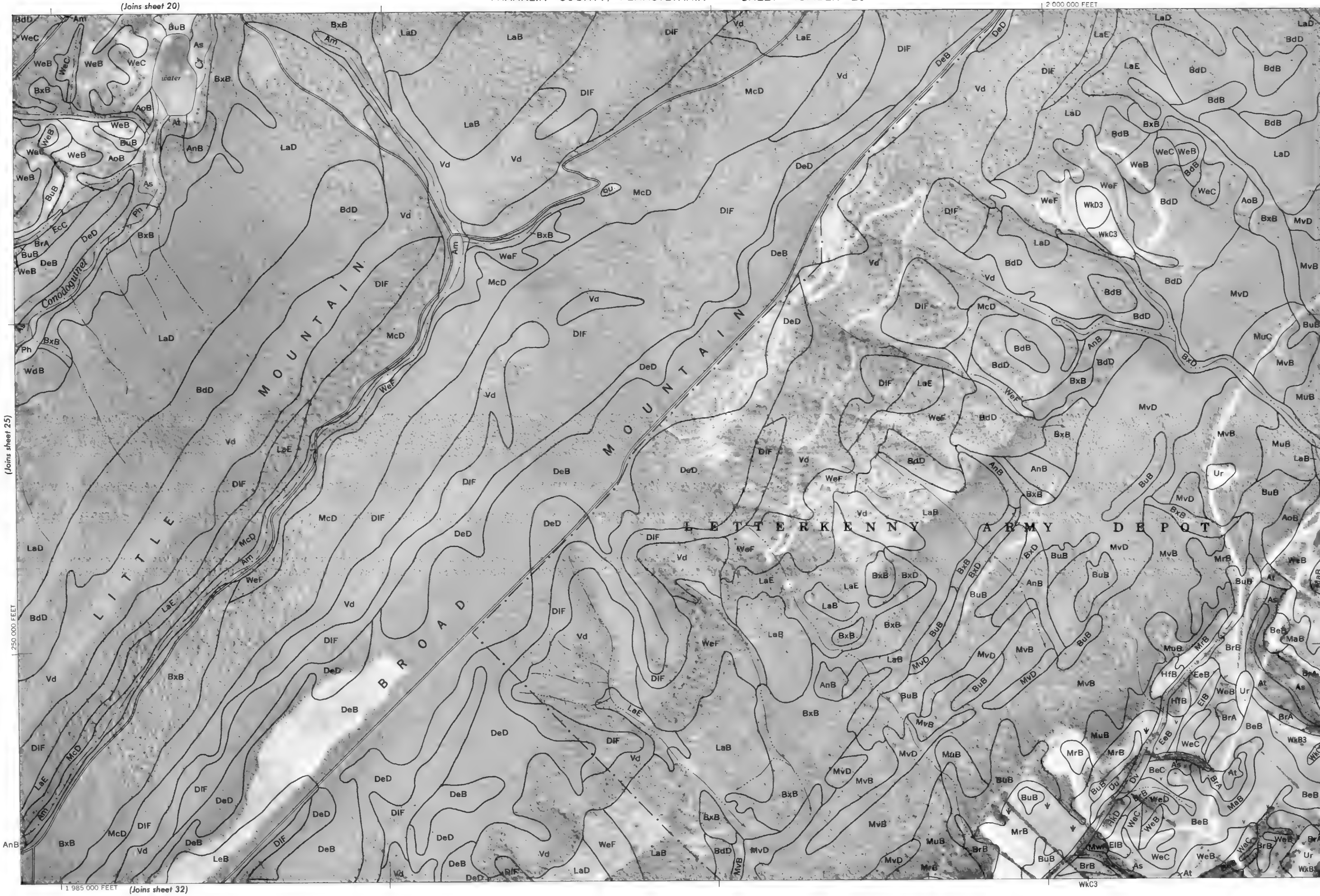
FRANKLIN COUNTY, PENNSYLVANIA NO 25

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 26

N



Scale 1:15 840

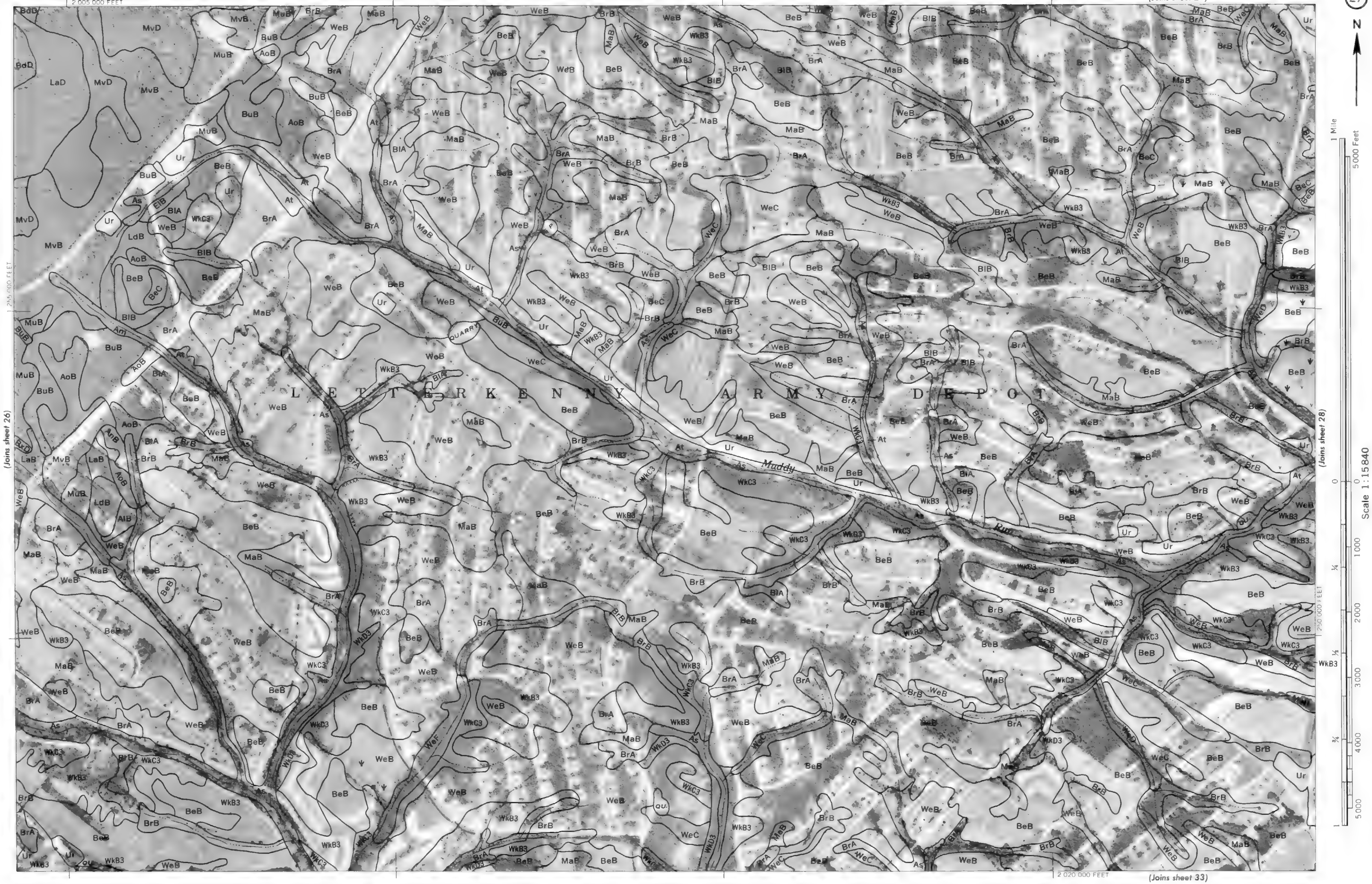
1 Mile — 5000 Feet — 0 — 1000 — 2000 — 3000 — 4000 — 5000

¼ ½ ¾ 1

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY PENNSYLVANIA NO. 26

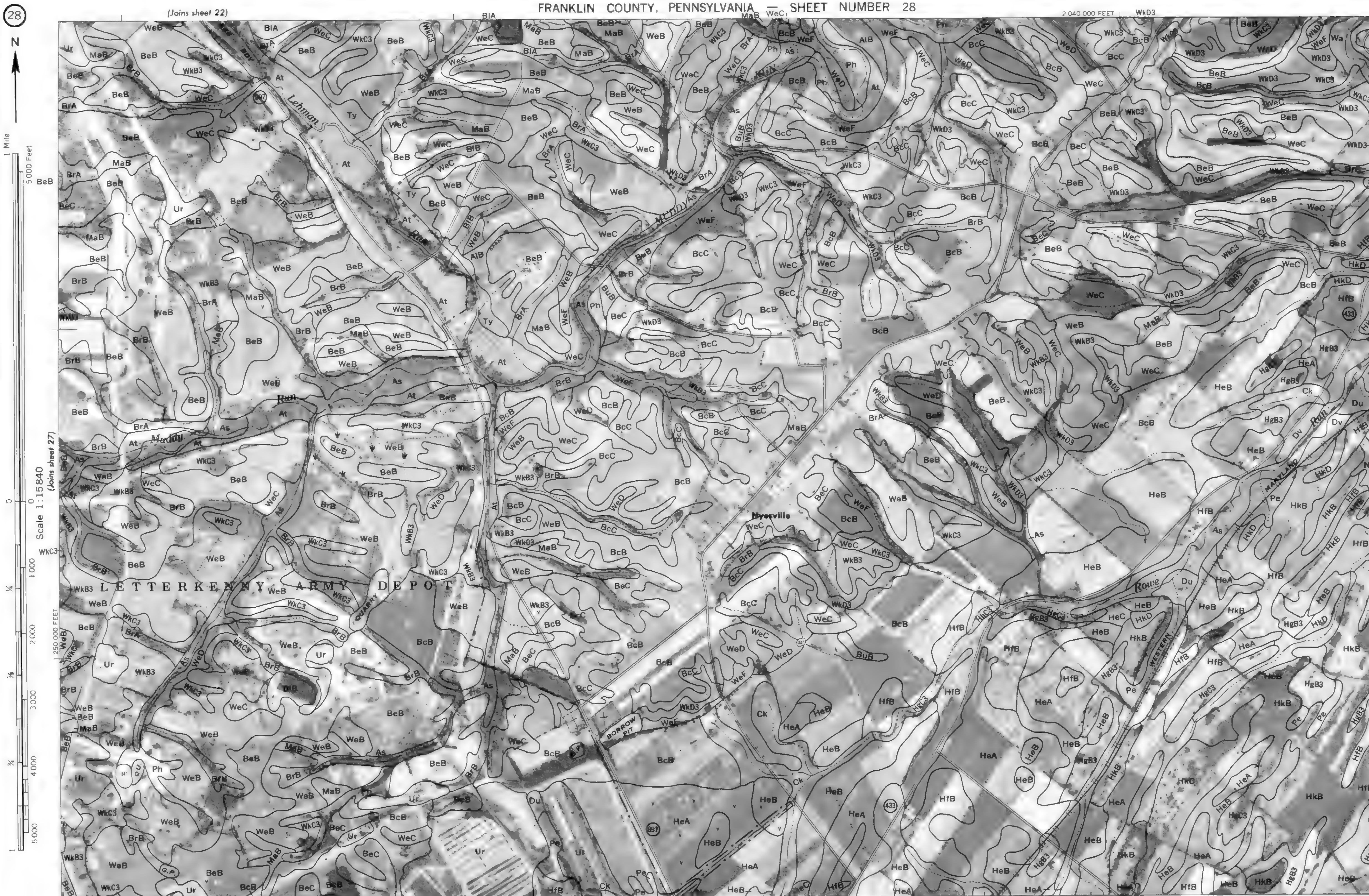


FRANKLIN COUNTY, PENNSYLVANIA NO 27

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 28



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone

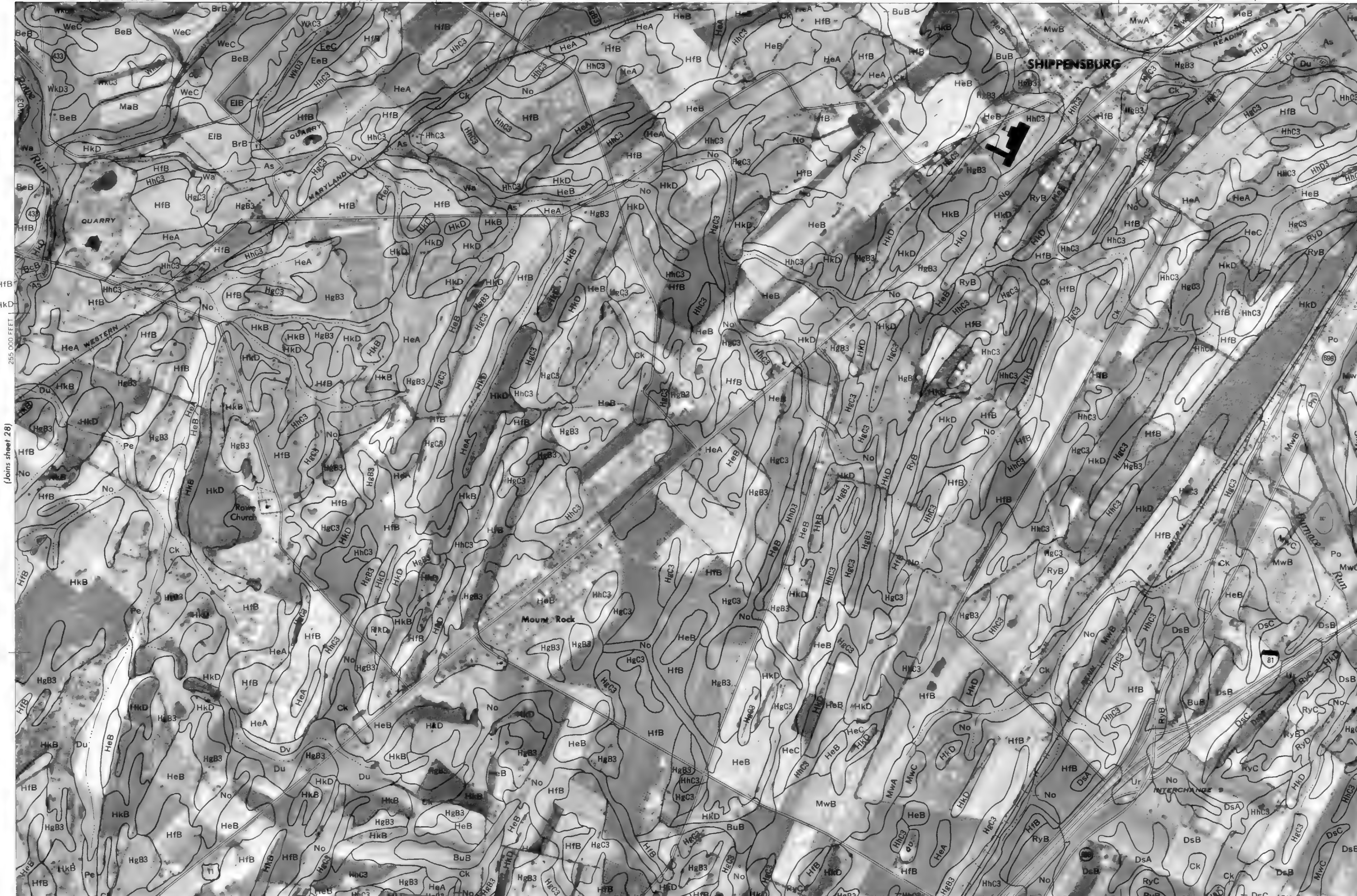
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission

FRANKLIN COUNTY, PENNSYLVANIA NO. 28

(29)

(Joins sheet 23)

2 045 000 FEET



(Joins sheet 28)

(Joins inset A, sheet 13)

255 000 FEET

250 000 FEET

2 060 000 FEET

(Joins sheet 35)

Scale 1:15840

1 Mile

5000 Feet

FRANKLIN COUNTY, PENNSYLVANIA NO. 29

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

N

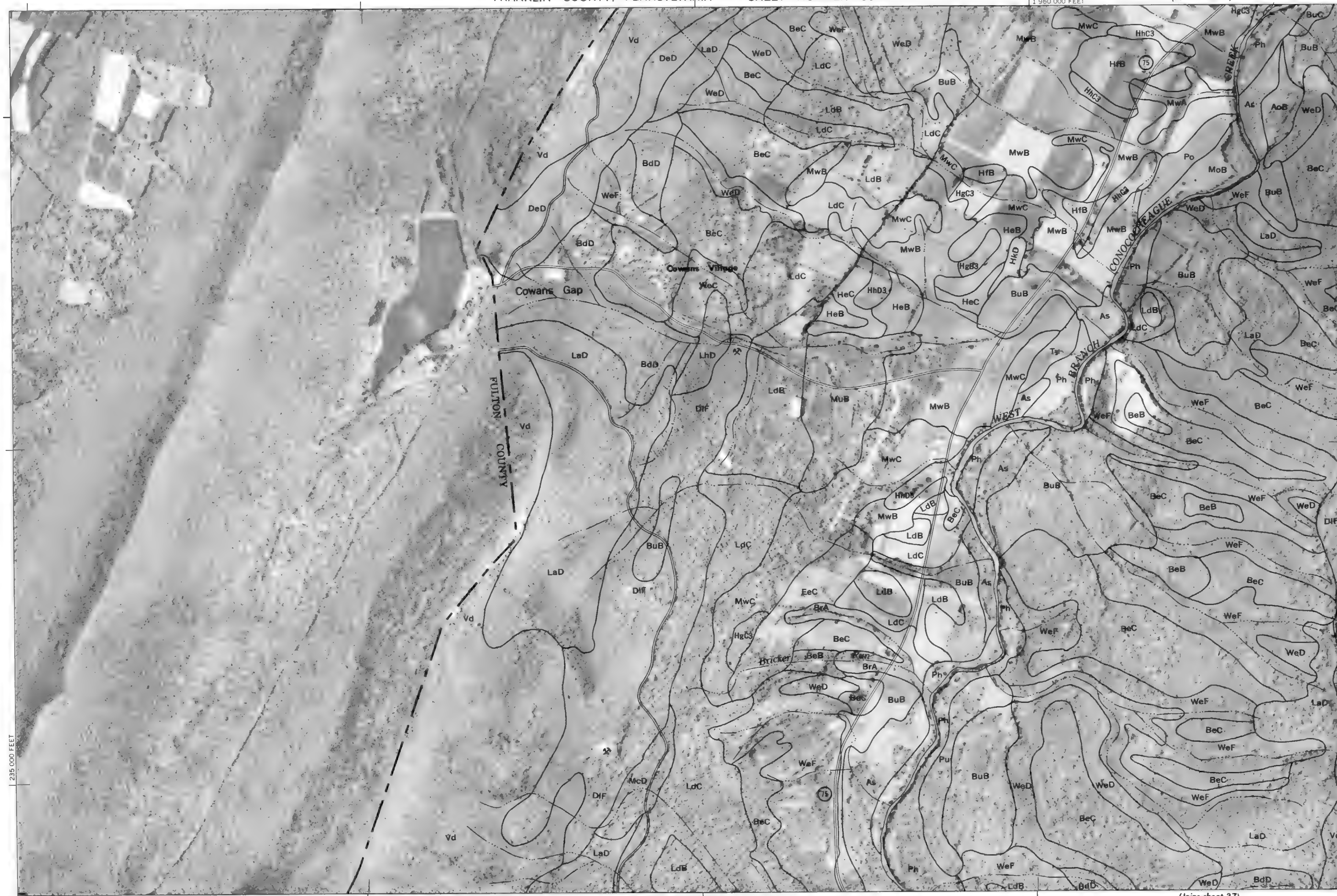
1 Mile

5000 Feet

Scale 1:15840

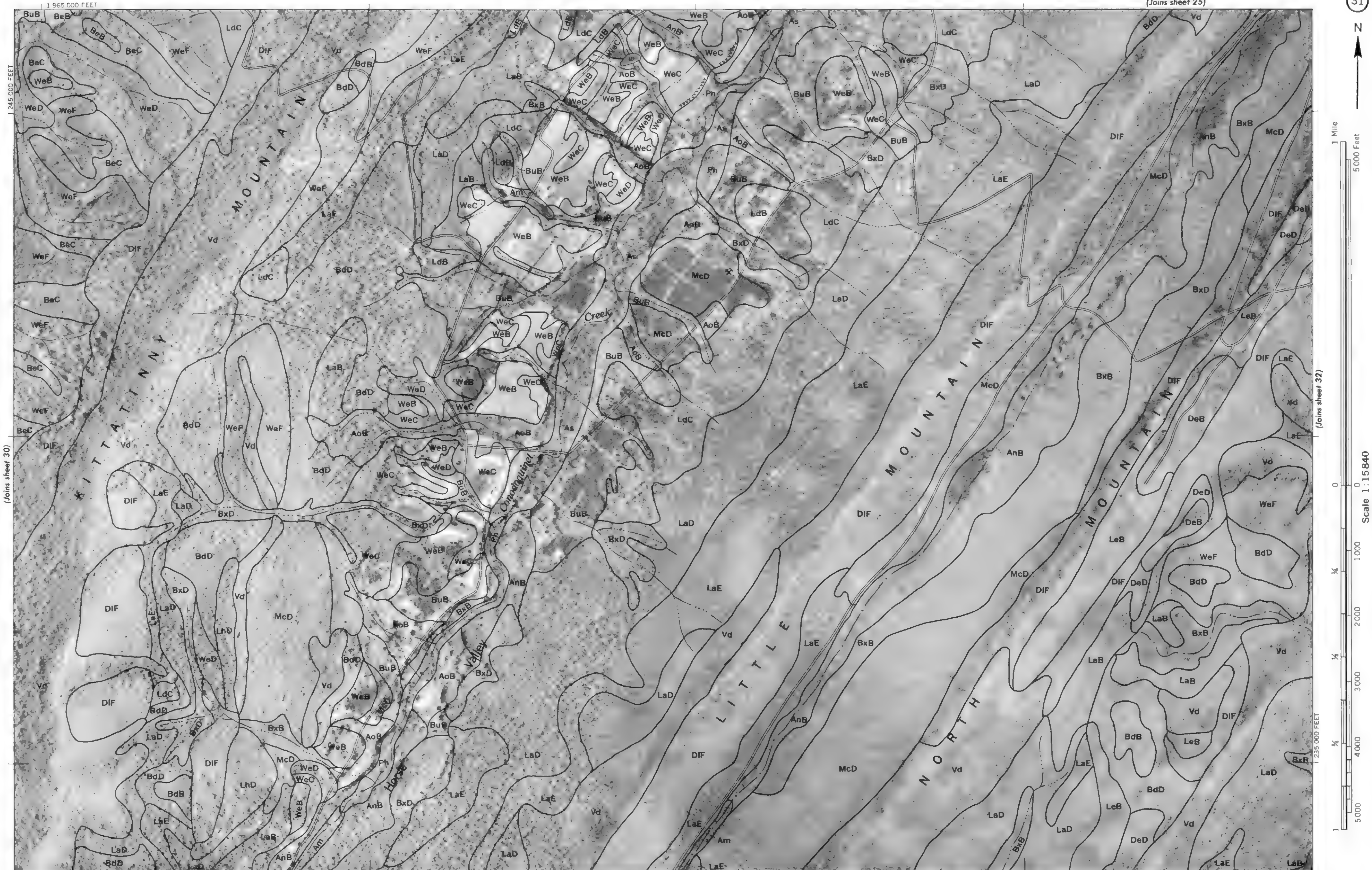
0 — 1000 — 2000 — 3000 — 4000 — 5000

0 — ¼ — ½ — ¾ — 1



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.



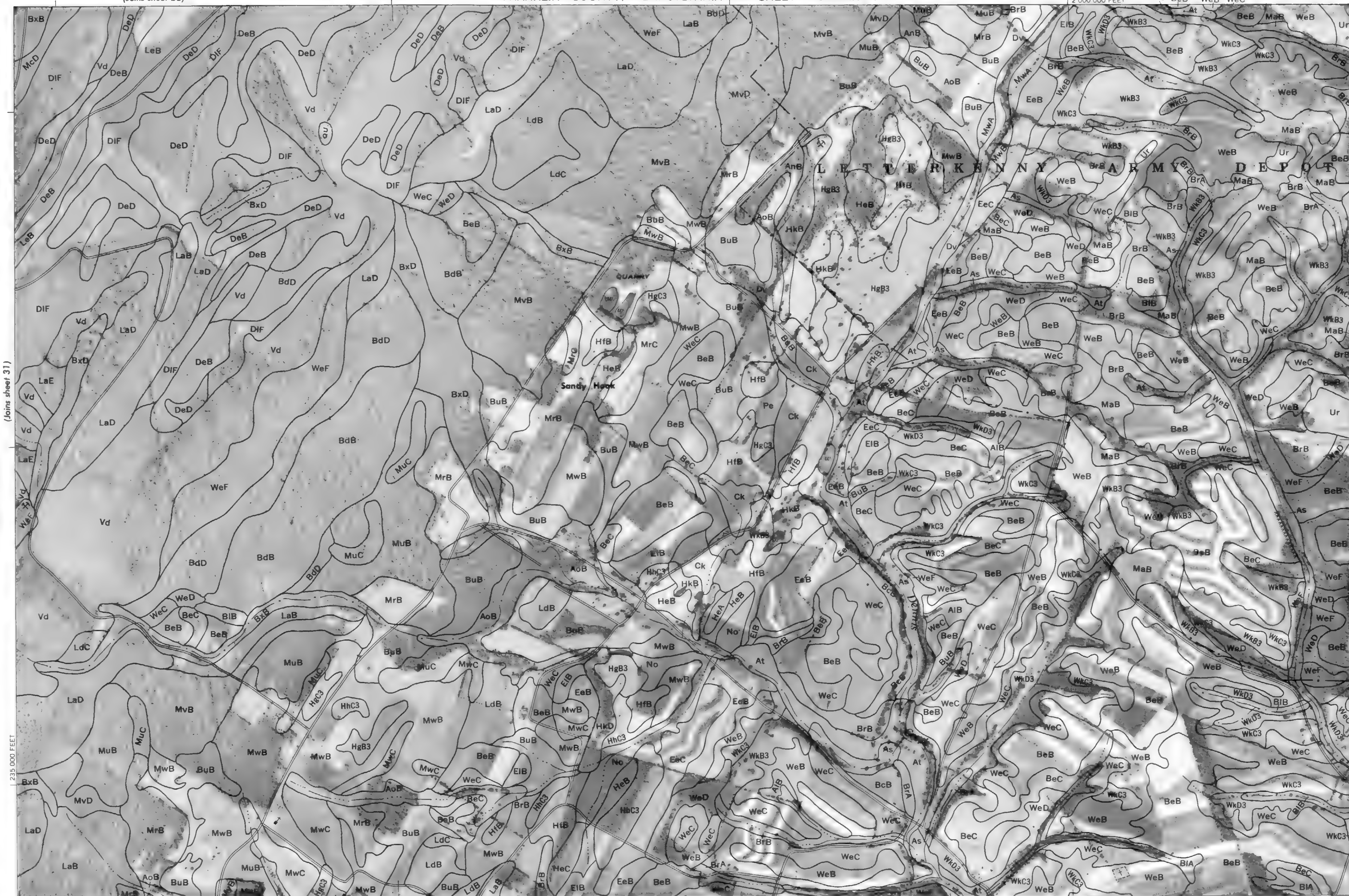
FRANKLIN COUNTY, PENNSYLVANIA NO. 31

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 32

(Joins sheet 26)



(Joins sheet 31)

(Joins sheet 33)

(Joins sheet 39)

N

1 Mile

5000 Feet

Scale 1:15840

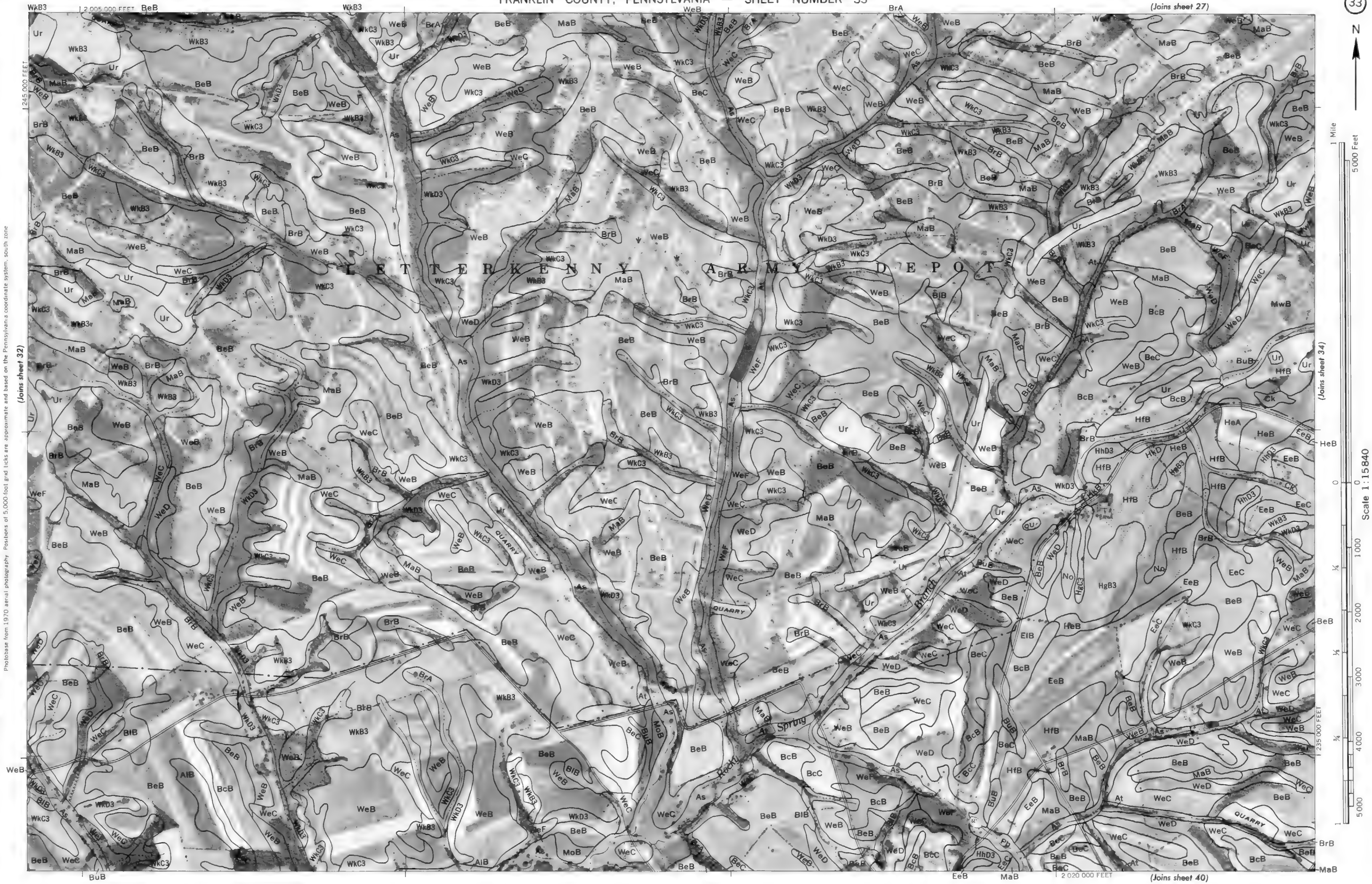
0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 32



FRANKLIN COUNTY, PENNSYLVANIA NO. 33

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

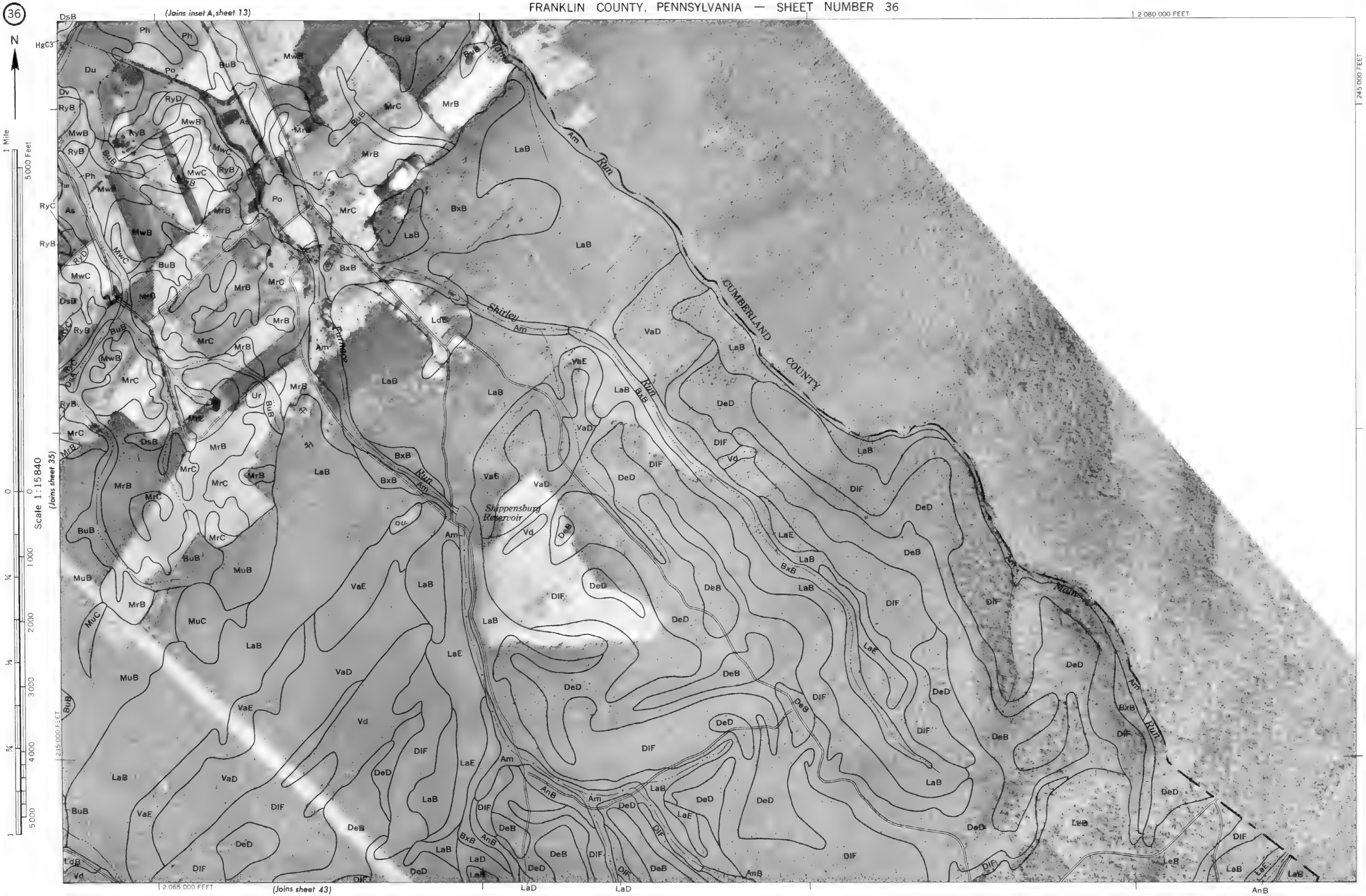
FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 34

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone

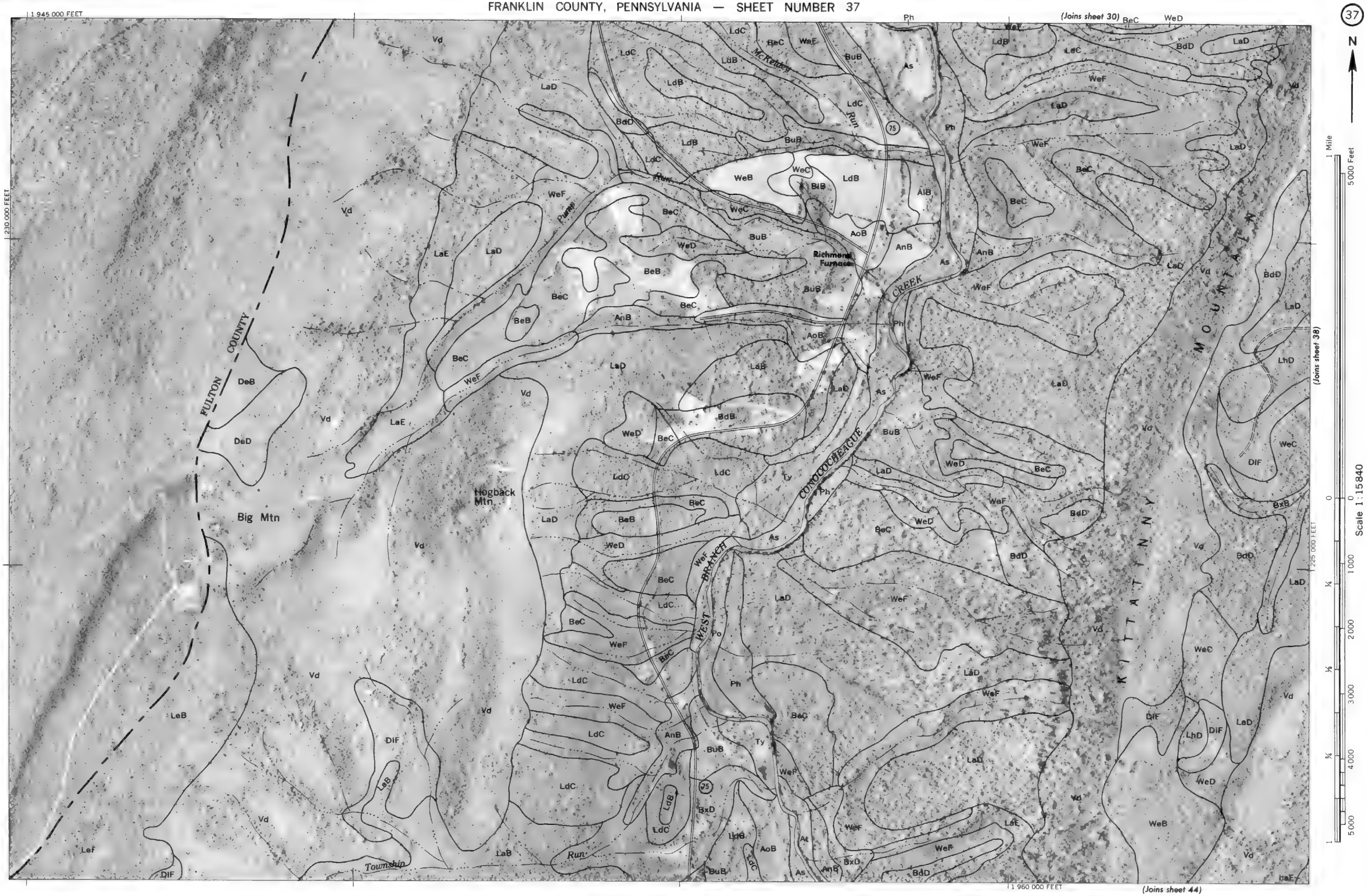
FRANKLIN COUNTY, PENNSYLVANIA NO. 35

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture and the Pennsylvania Department of Environmental Resources, State Conservation Commission.
Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.



This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

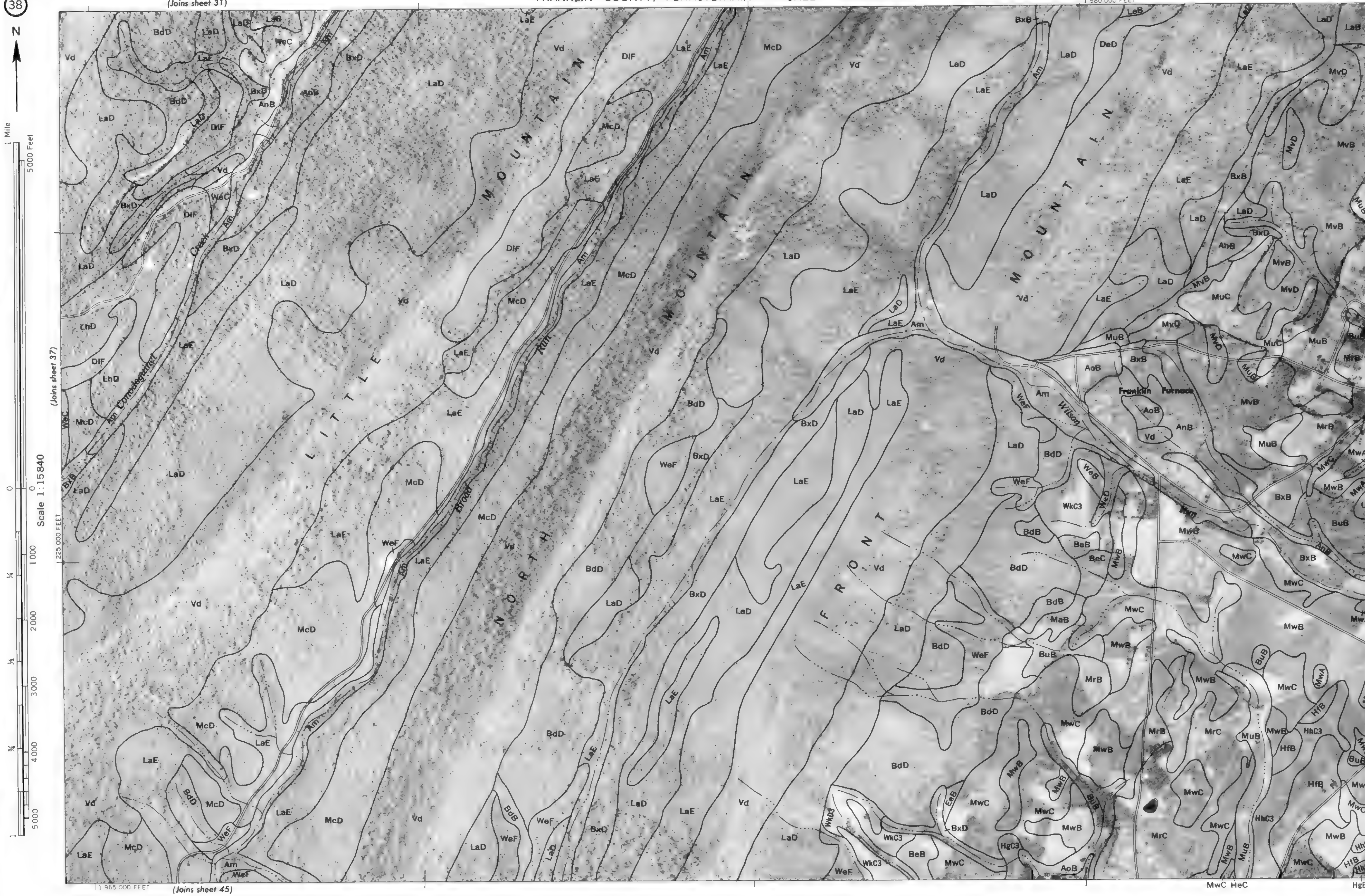


FRANKLIN COUNTY, PENNSYLVANIA NO. 37

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

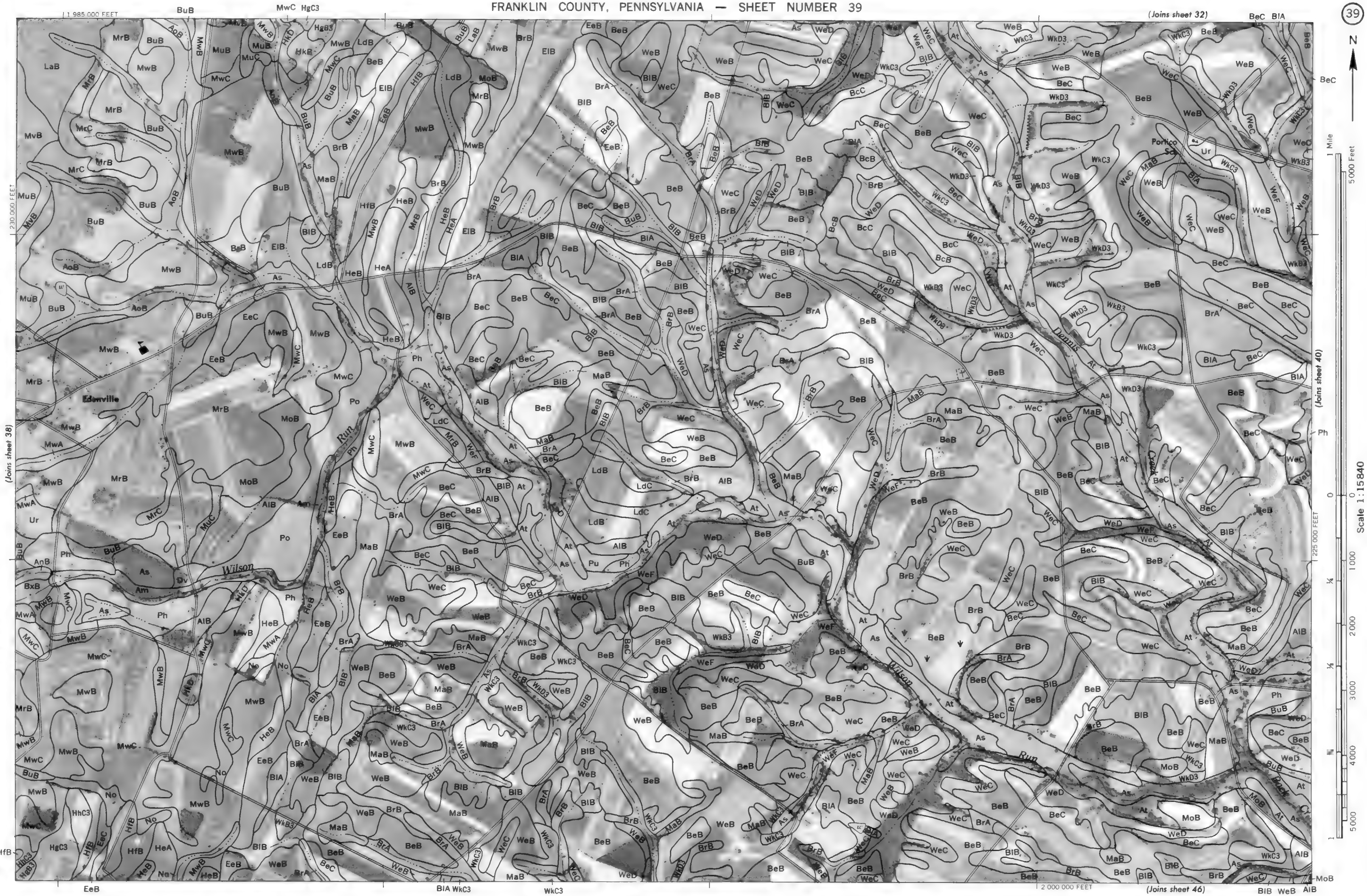
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 38



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission



FRANKLIN COUNTY, PENNSYLVANIA NO. 39

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

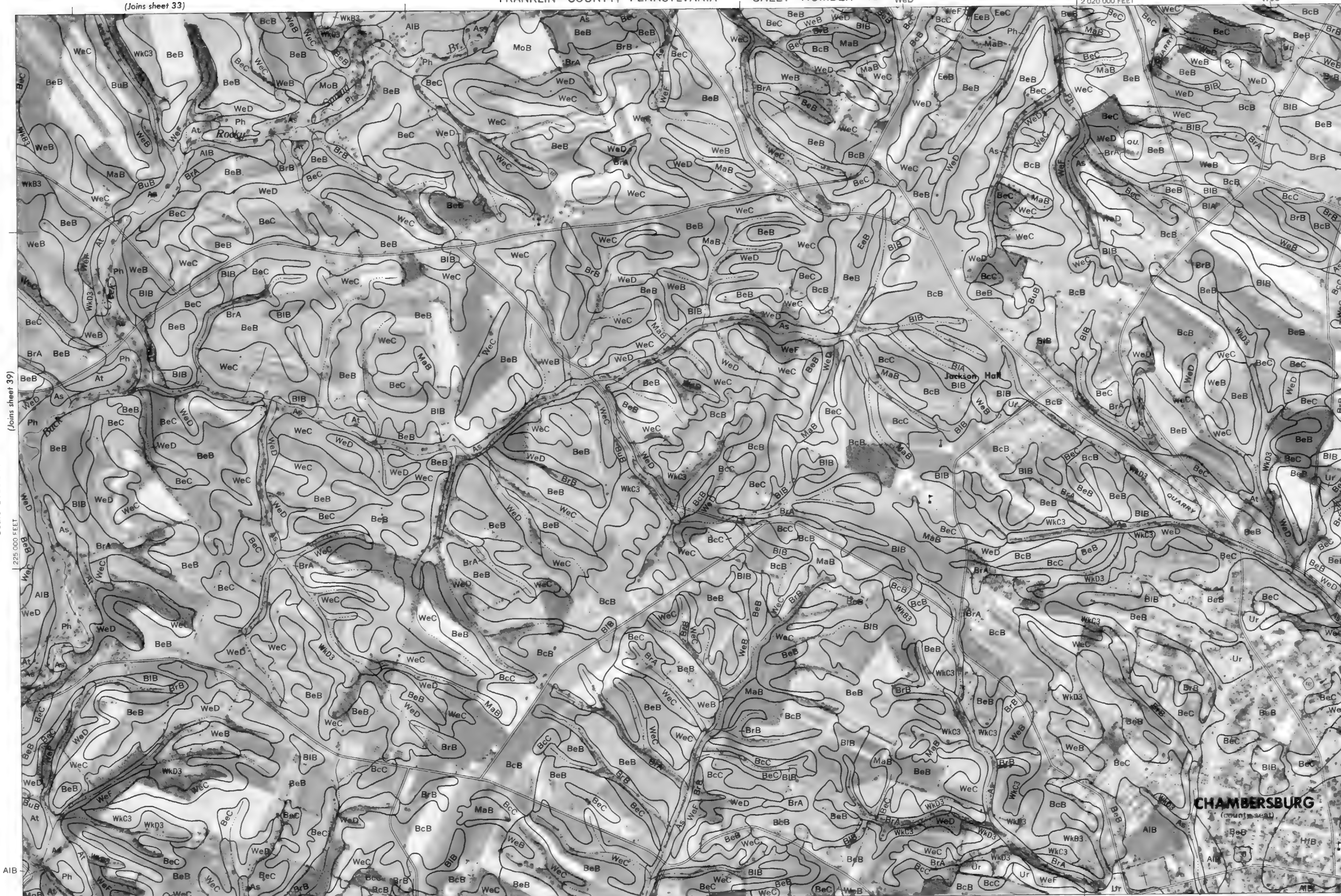
FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 40

N

Scale 1:15840

1 Mile

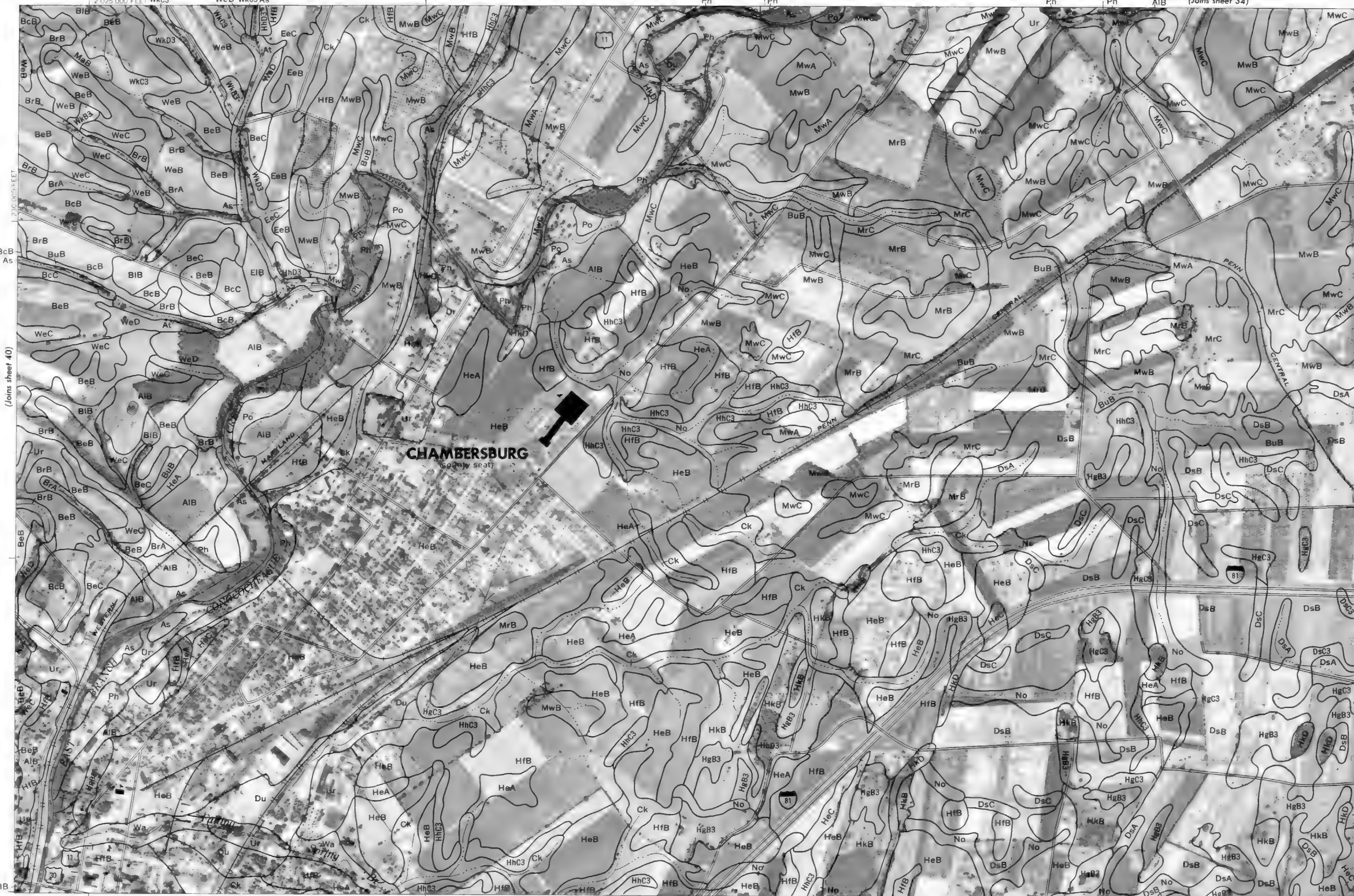
5000 Feet



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 40



FRANKLIN COUNTY, PENNSYLVANIA NO. 41

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

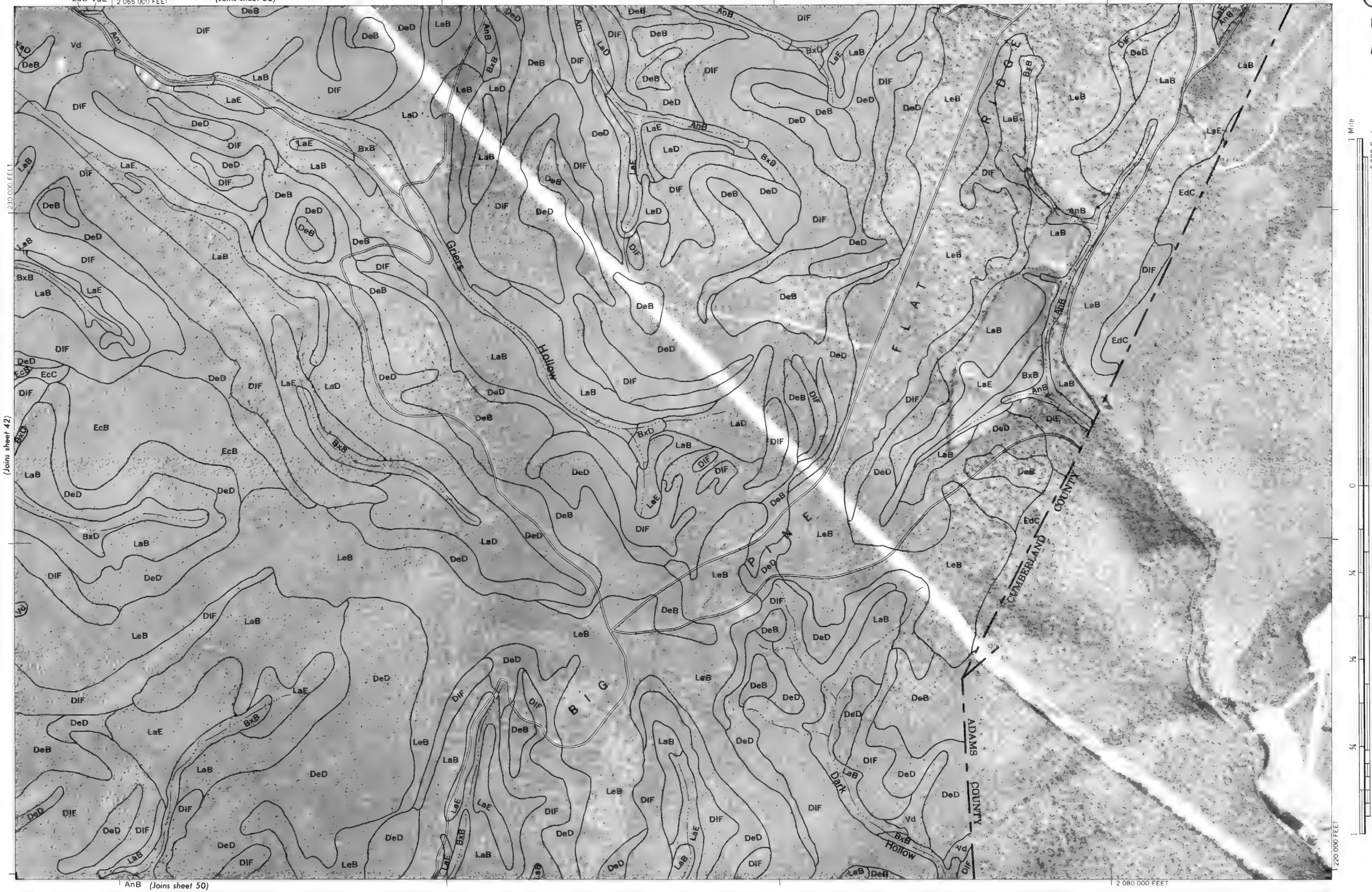
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 42

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission

FRANKLIN COUNTY, PENNSYLVANIA NO. 42



FRANKLIN COUNTY, PENNSYLVANIA NO. 43

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

(Joins sheet 37)

(Joins inset, sheet 51)

(Joins sheet 45)

(Joins sheet 52)

N

Scale 1:15840

1 Mile — ¾ — ½ — ¼ — 0

5000 Feet — 4000 — 3000 — 2000 — 1000 — 0

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission

FRANKLIN COUNTY, PENNSYLVANIA NO. 45

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 46

(Joins sheet 39)

N

1 Mile

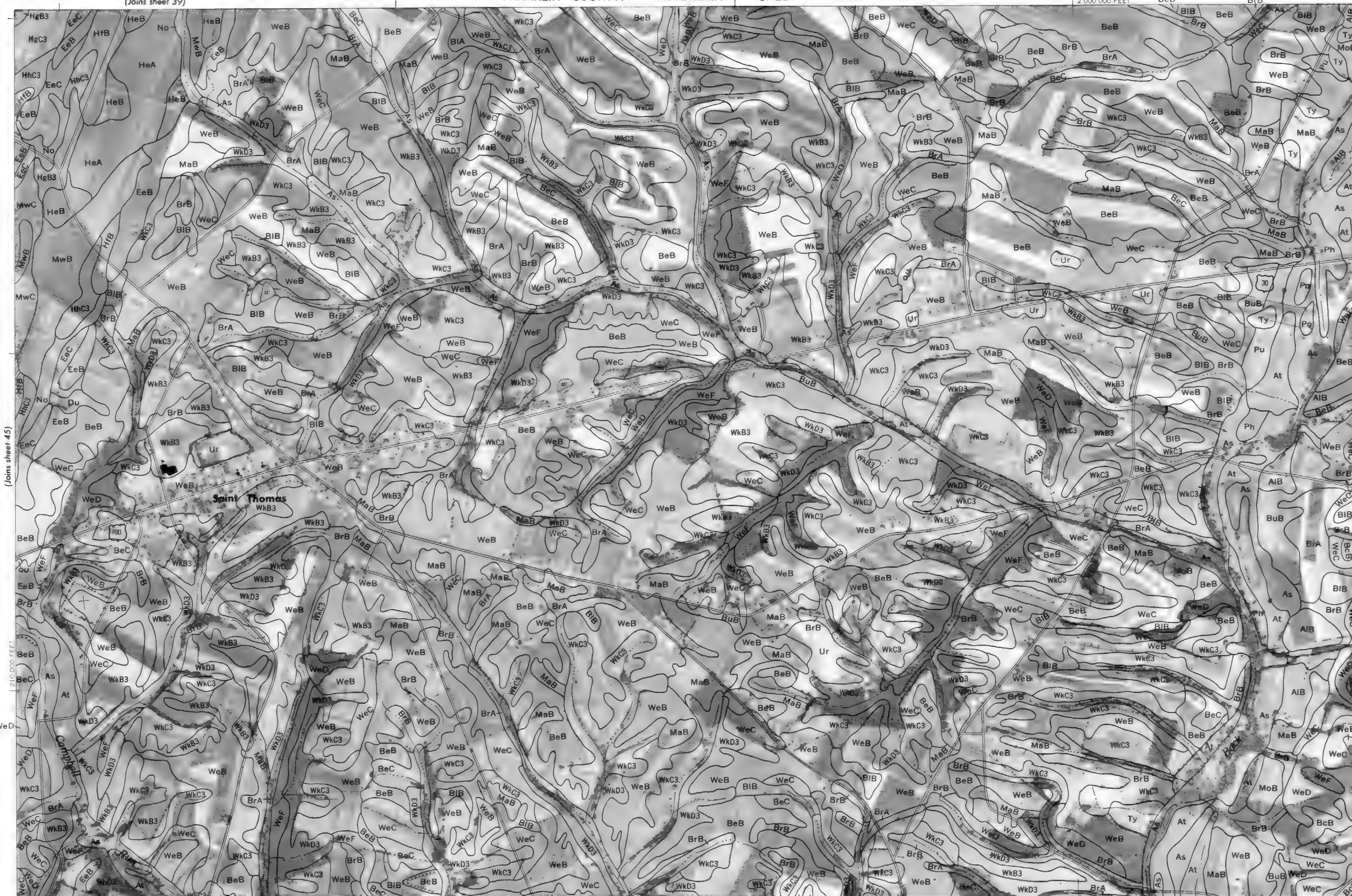
5000 Feet

Scale 1:15840

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

(Joins sheet 45)

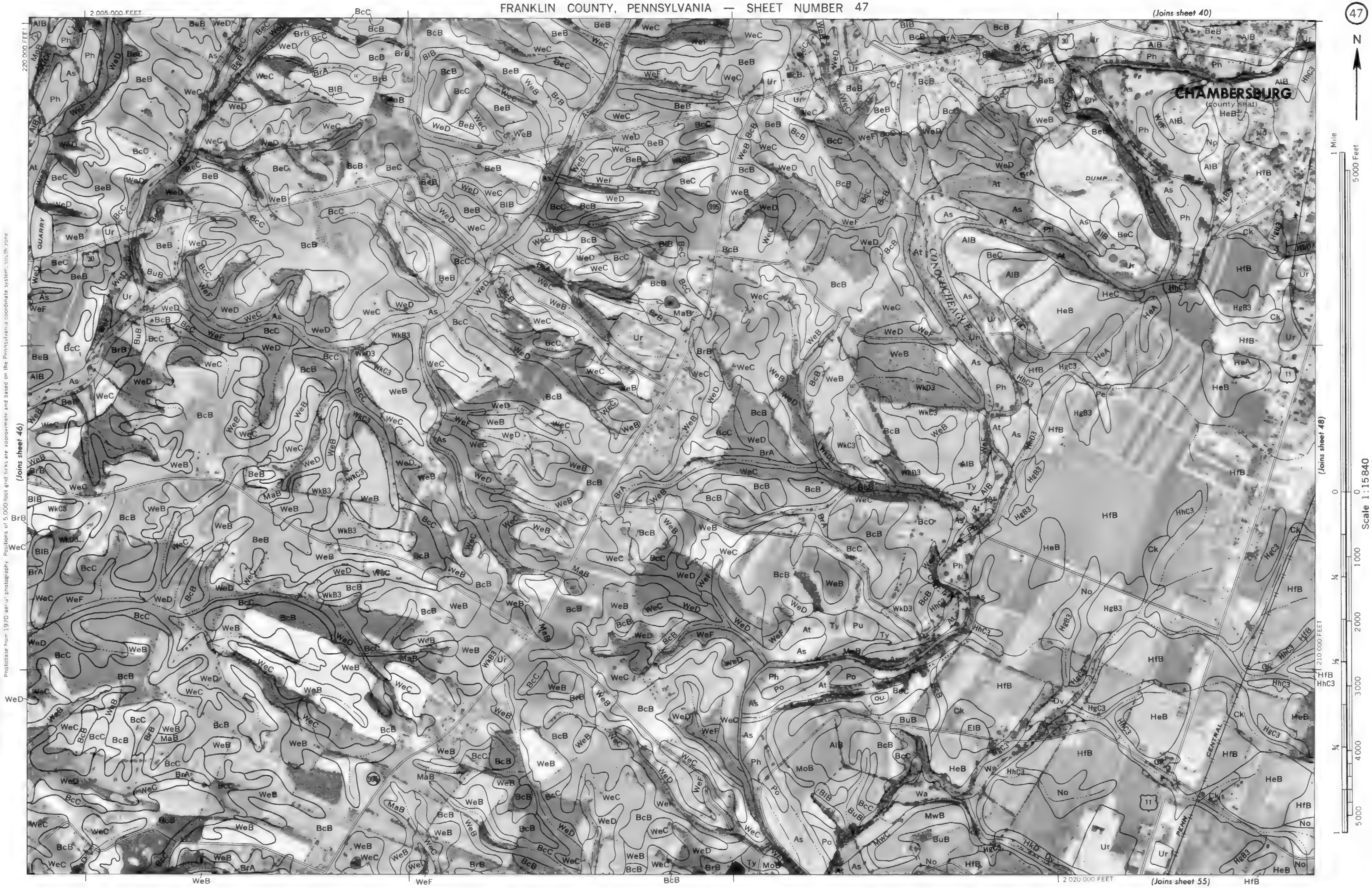


(Joins sheet 47)

(Joins sheet 54)

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.



FRANKLIN COUNTY, PENNSYLVANIA NO. 47

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 48

(Joins sheet 41)

(Joins sheet 47)

(Joins sheet 49)

(Joins sheet 56)

N

Scale 1:15 840

1 Mile — 5000 Feet

0, 1000, 2000, 3000, 4000, 5000

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

49

(Joins sheet 42)

(Joins sheet 48)

(Joins sheet 50)

(Joins sheet 57)

N

Scale 1:15840

1 Mile

5000 Feet

0

1000

2000

3000

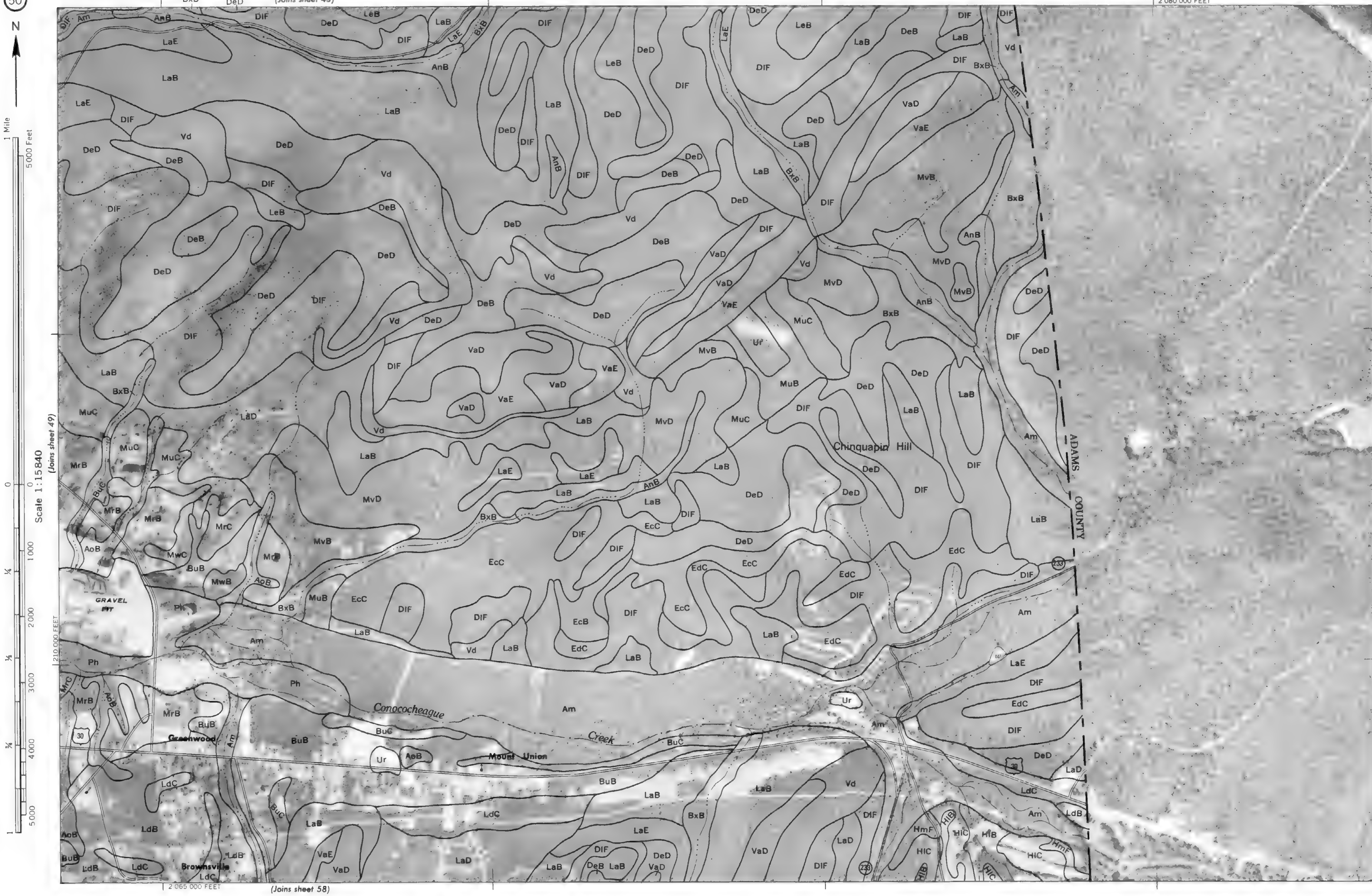
4000

5000

FRANKLIN COUNTY, PENNSYLVANIA NO. 49

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

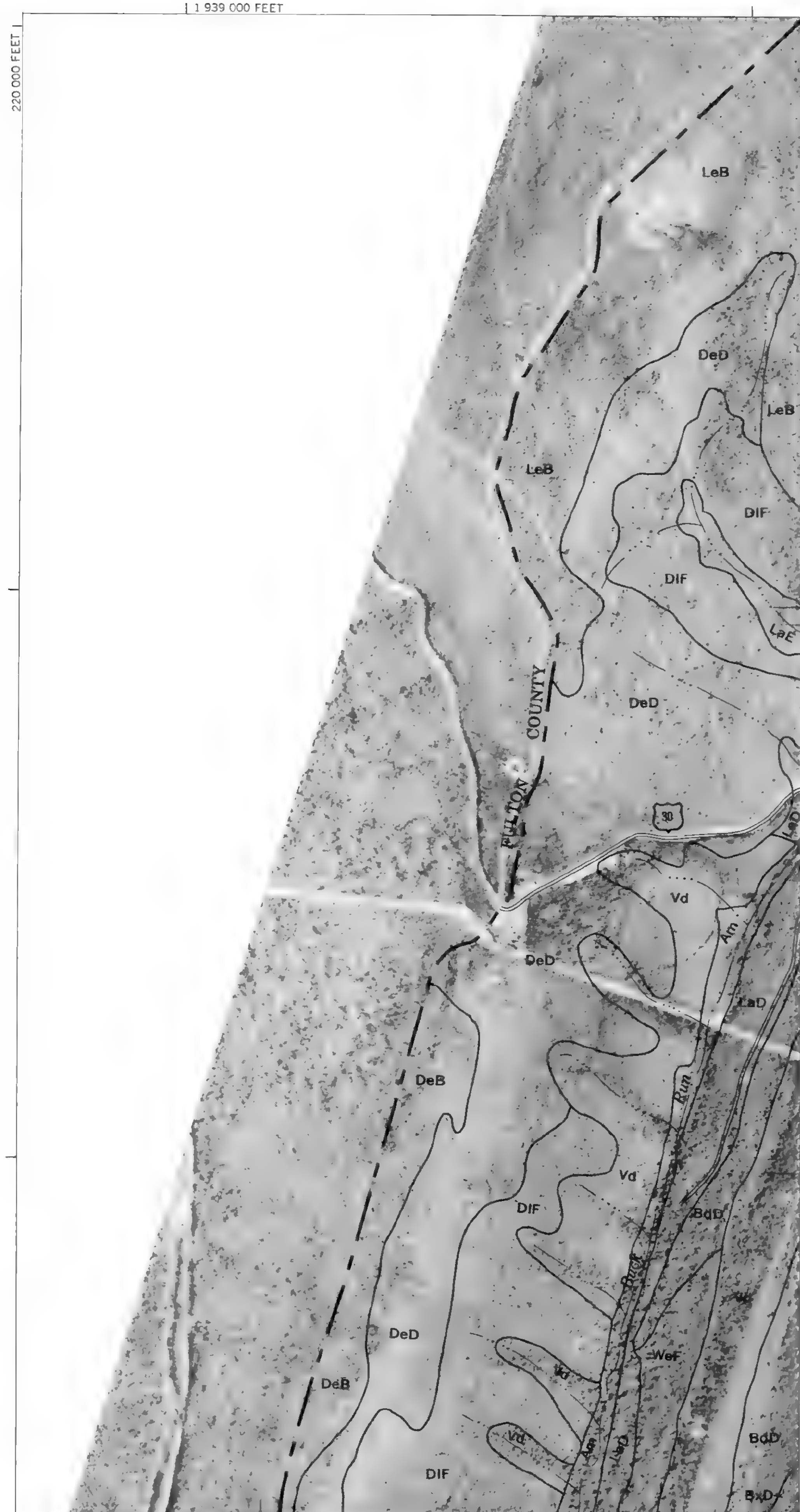
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

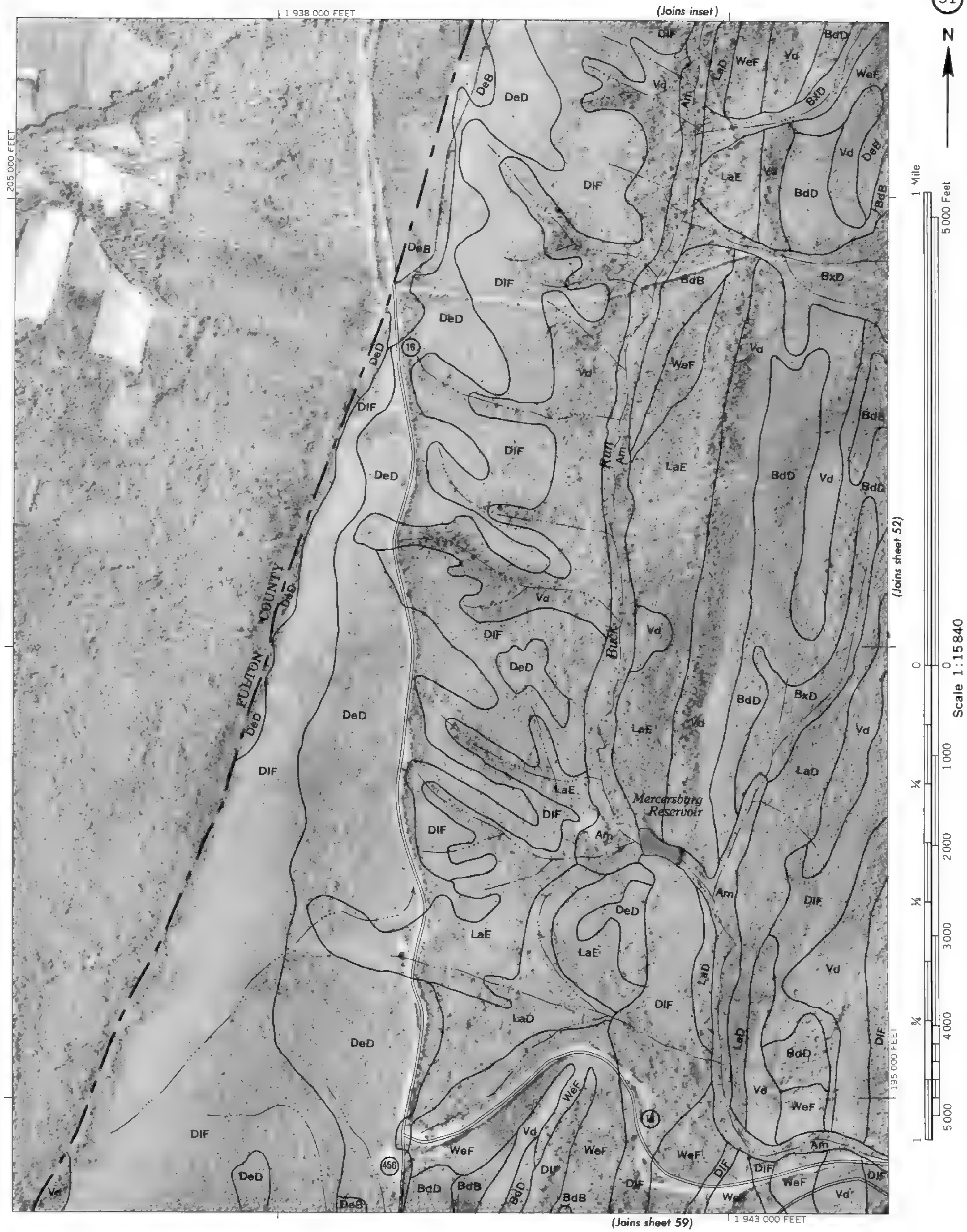


Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 51

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.





FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 52

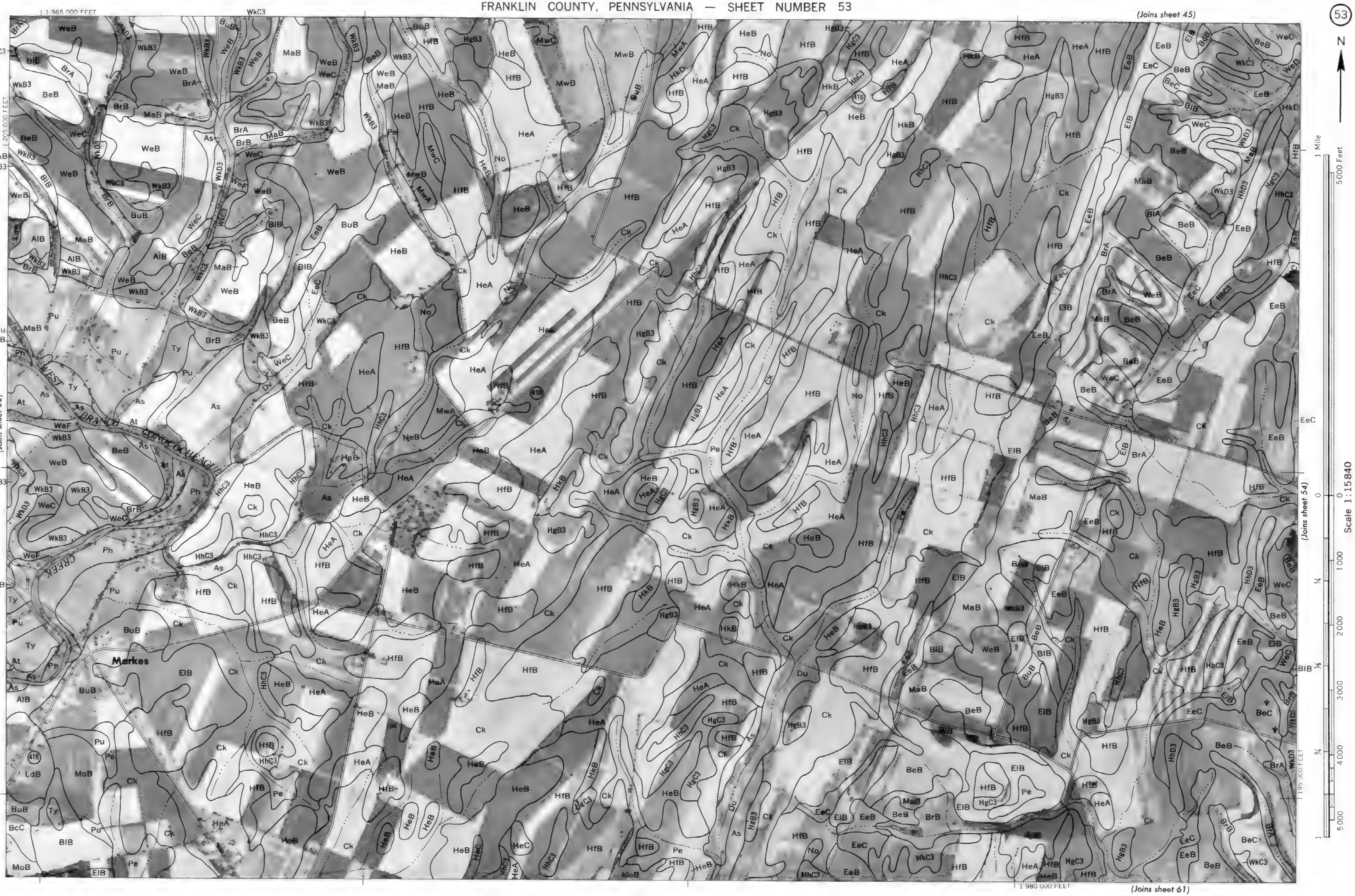
N

1 Mile — 5 000 Feet

Scale 1:15840

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

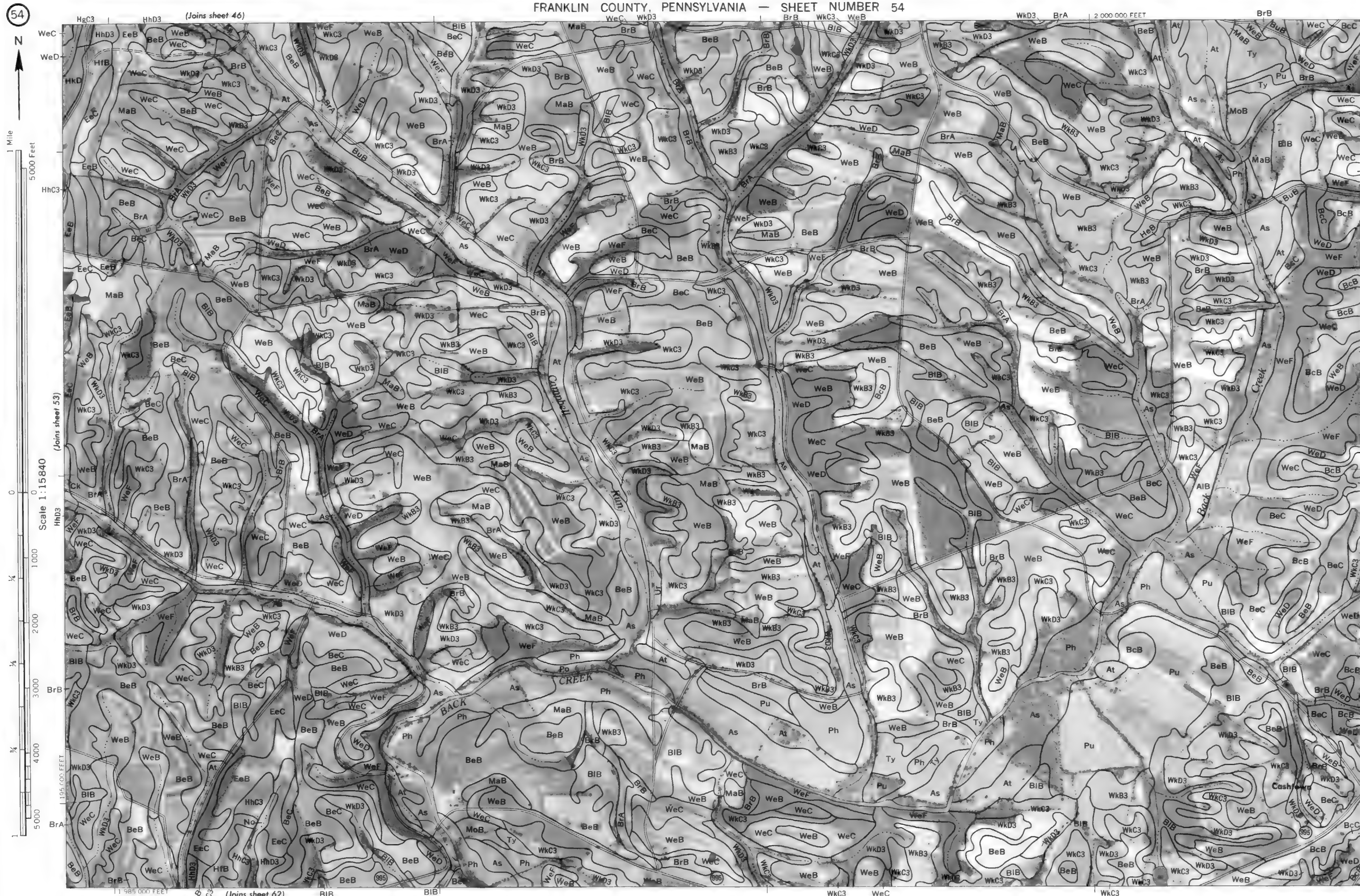


FRANKLIN COUNTY, PENNSYLVANIA NO. 53

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

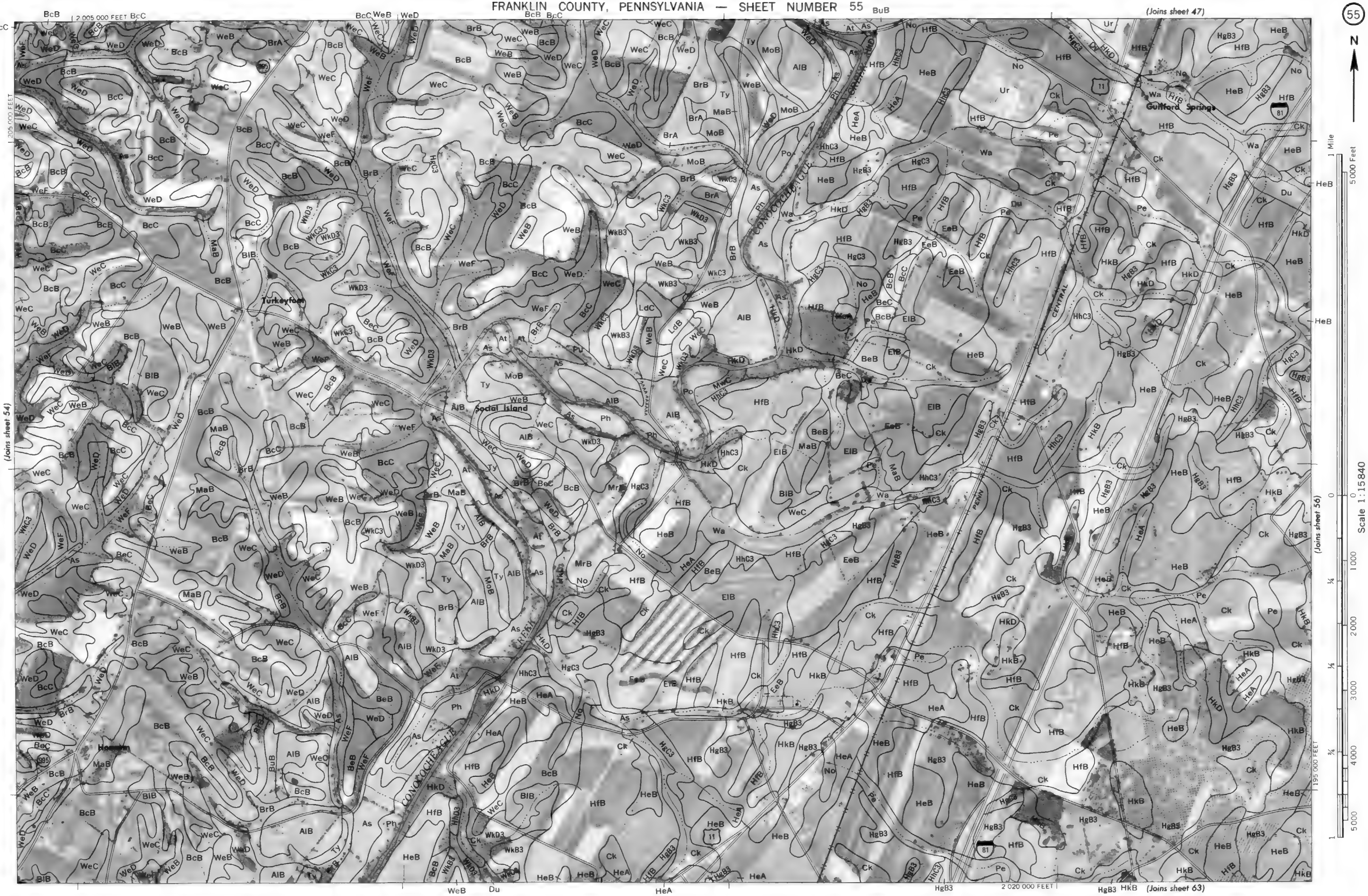
FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 54



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

55

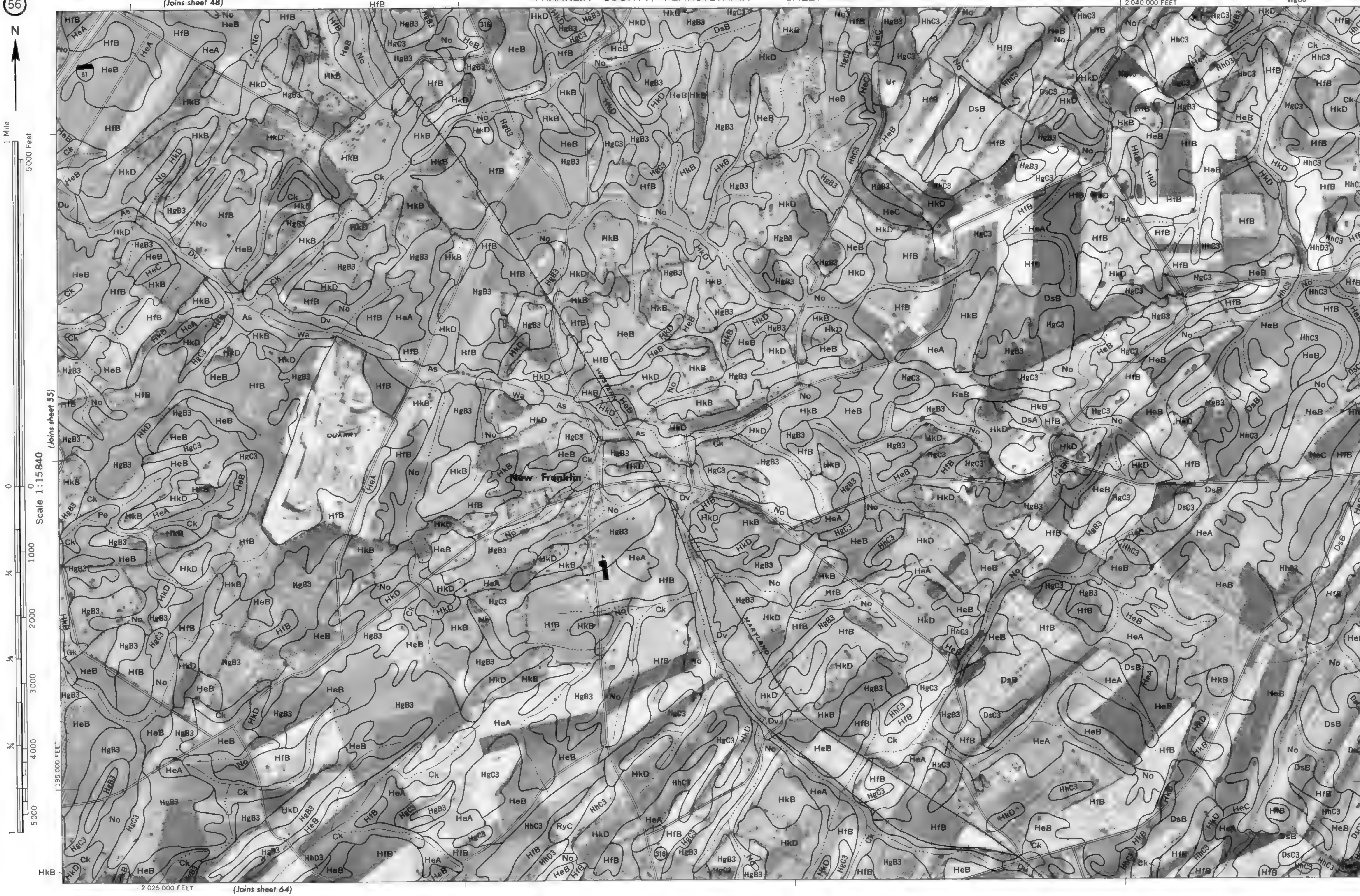


FRANKLIN COUNTY, PENNSYLVANIA NO. 55

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

(56)

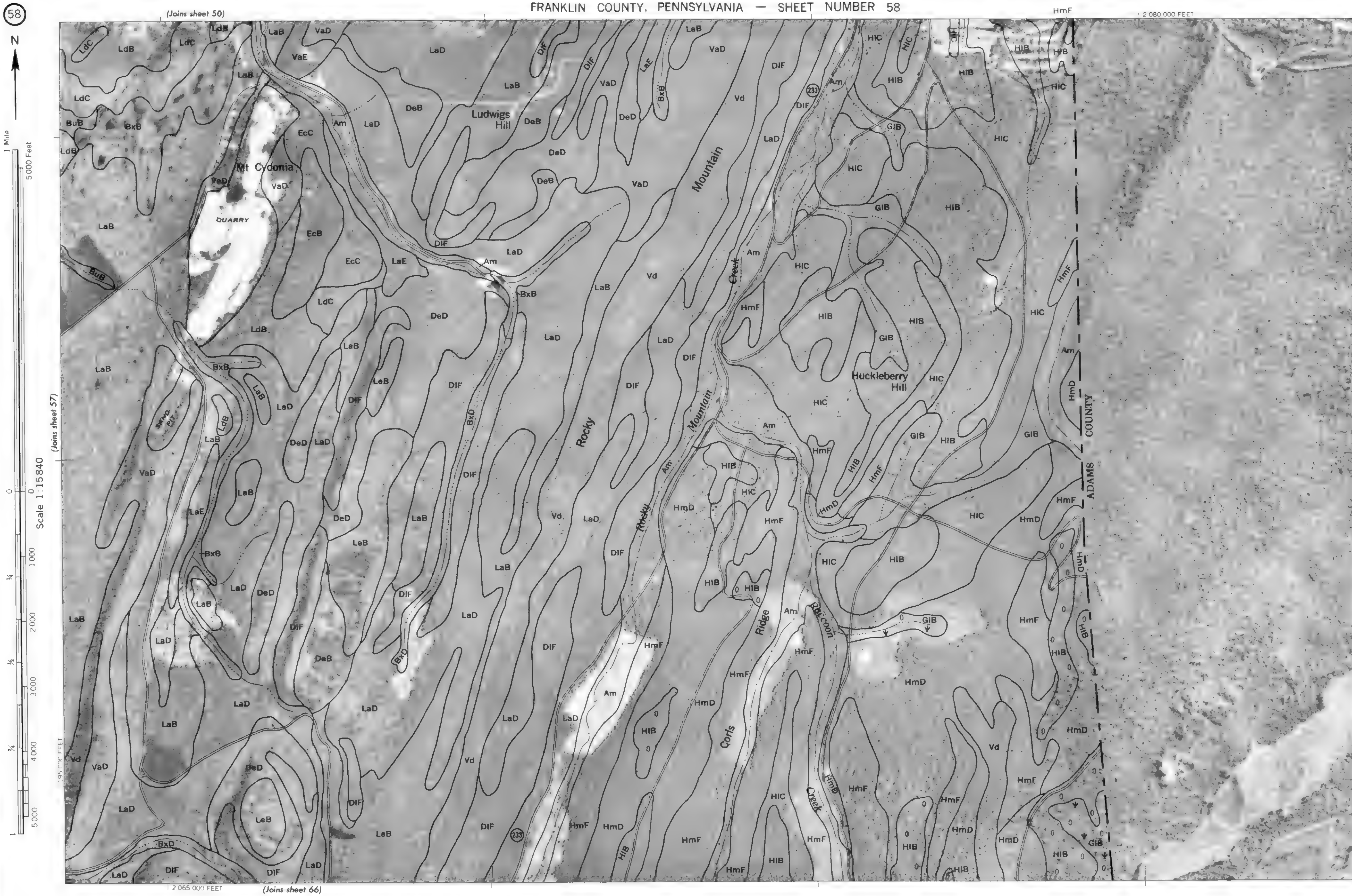


Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 57

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.



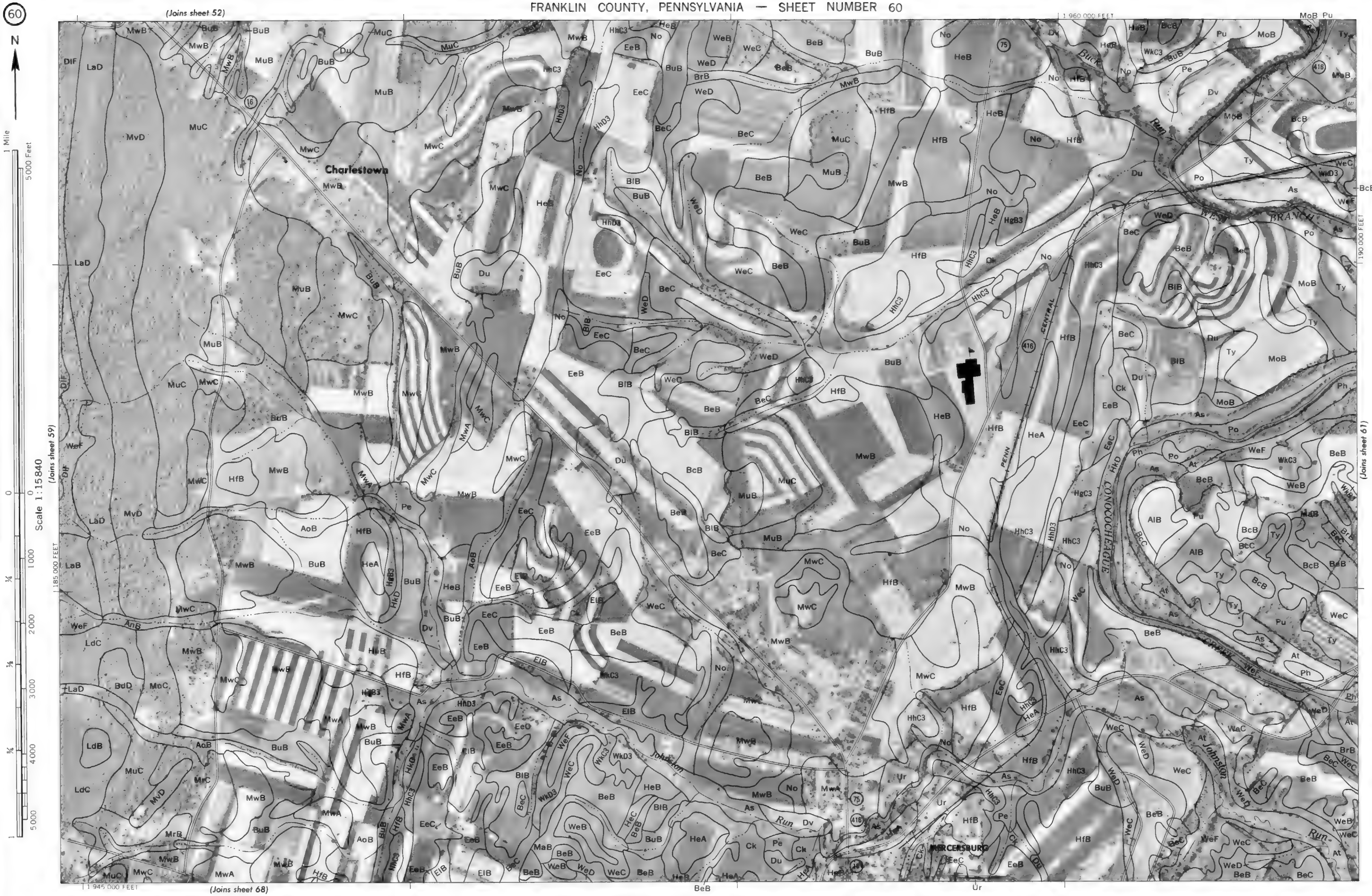
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 59

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

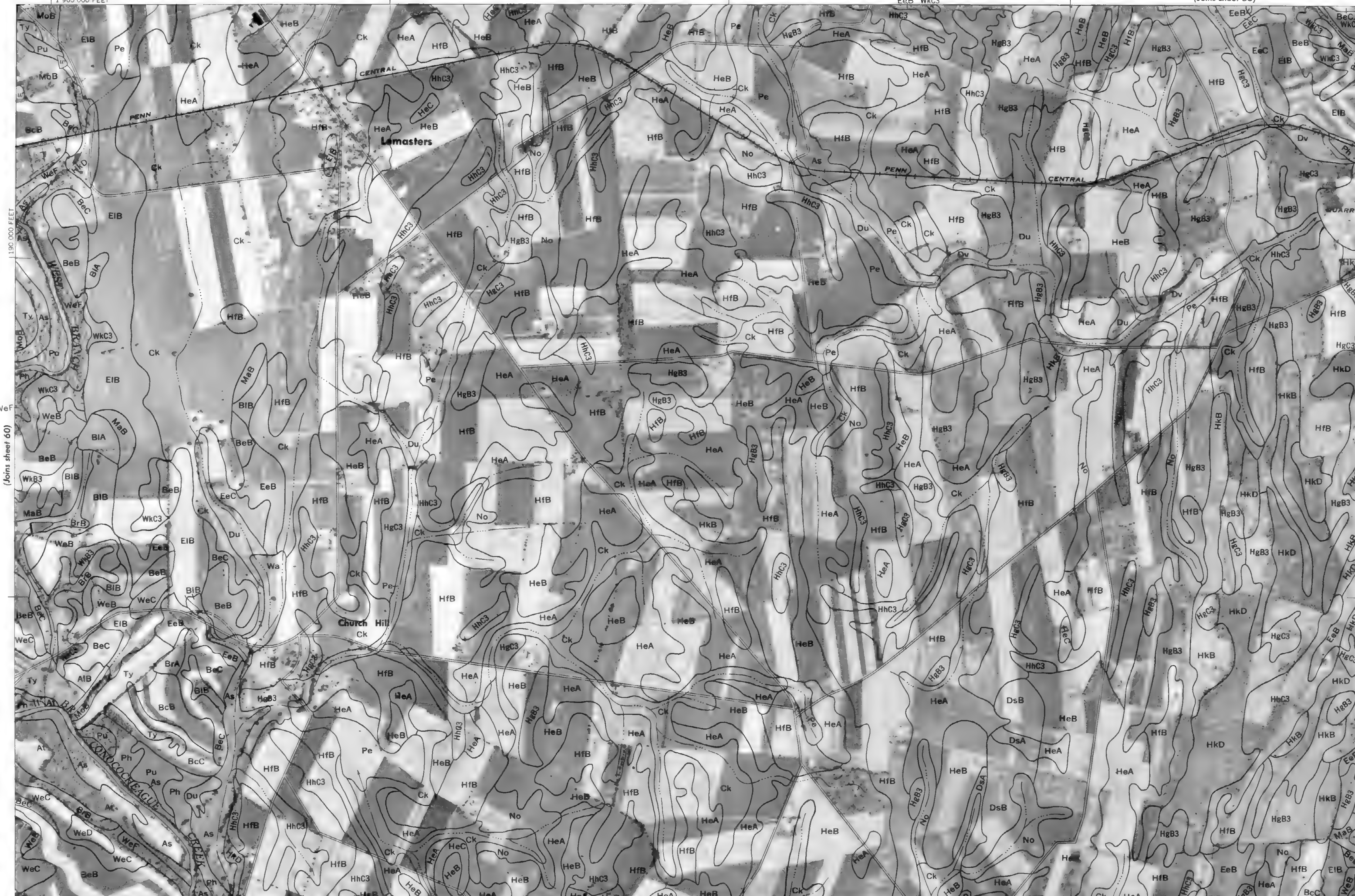
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

61



N

Scale 1:15840

1 Mile

5000 Feet

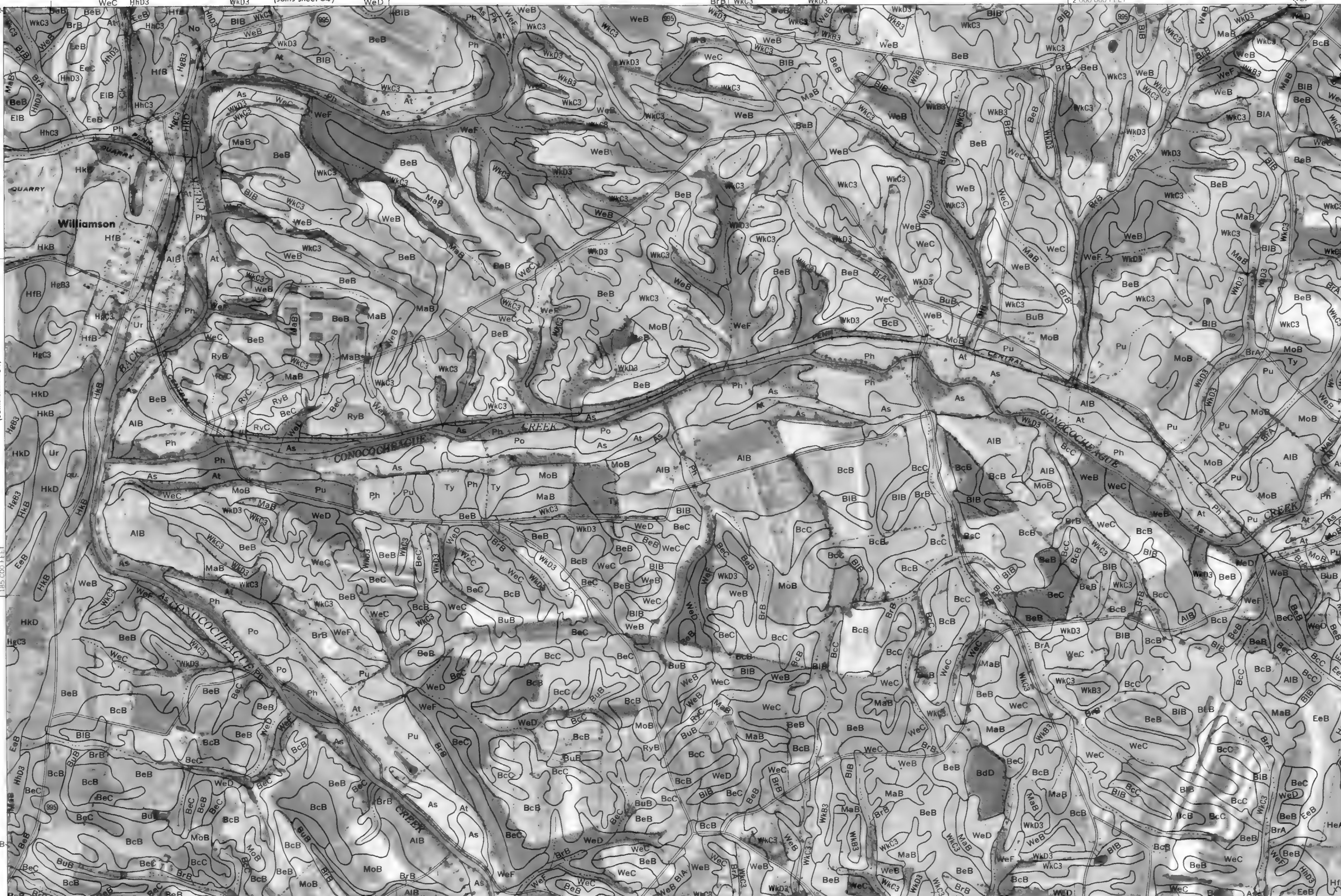
FRANKLIN COUNTY, PENNSYLVANIA NO. 61

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 62

(Joins sheet 54)



(Joins sheet 61)

(Joins sheet 63)

(Joins sheet 70)

N

Scale 1:15840

1 Mile

5000 Feet

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 62

63

FRANKLIN COUNTY, PENNSYLVANIA NO. 63

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University College of Agriculture and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

Scale 1:15840

1 Mile ¾ ½ ¼ 0

5000 Feet 4000 3000 2000 1000 0 5000

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 64

N

1 Mile

5 000 Feet

Scale 1:15840

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

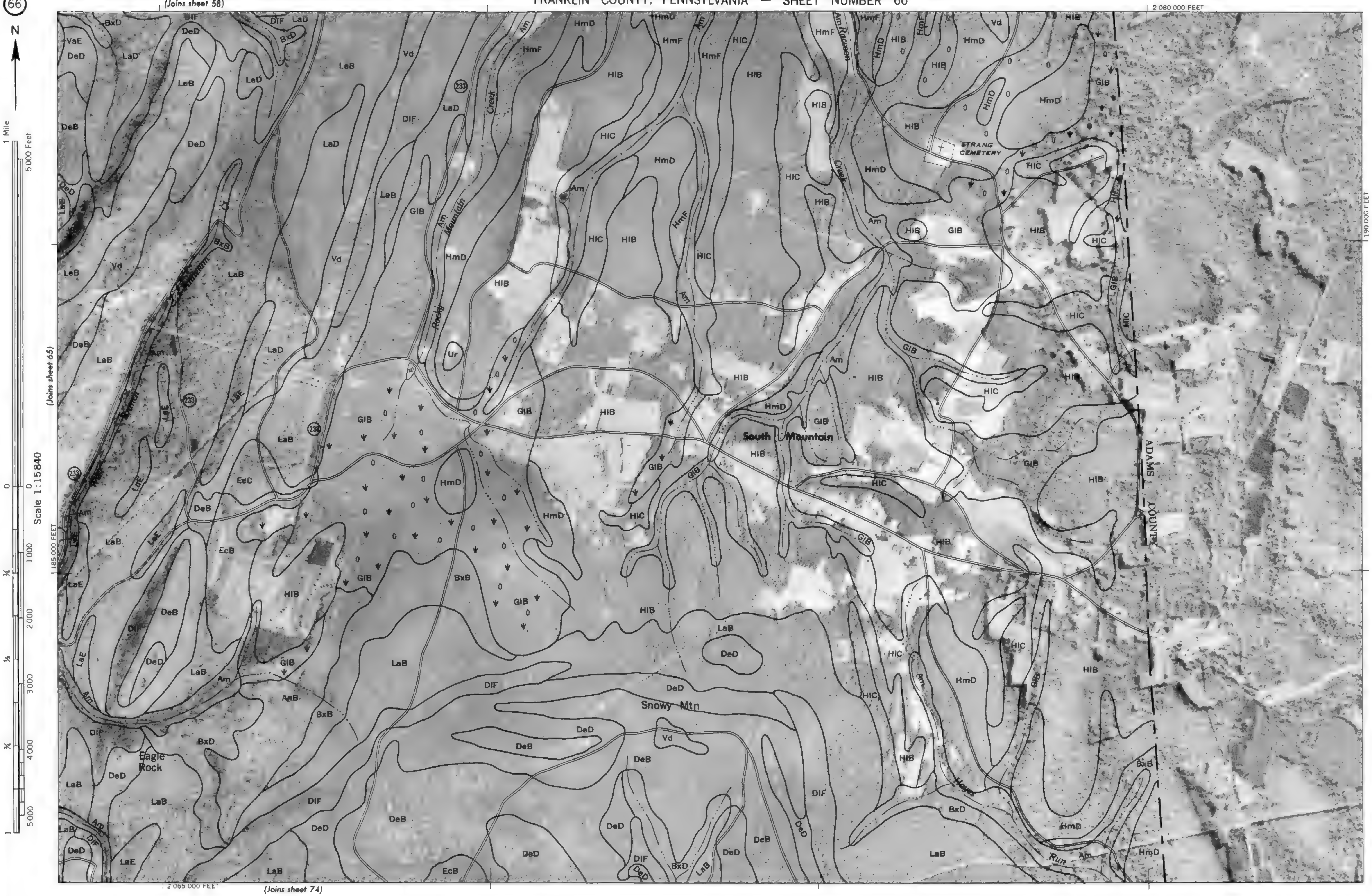
65

FRANKLIN COUNTY, PENNSYLVANIA NO. 65

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

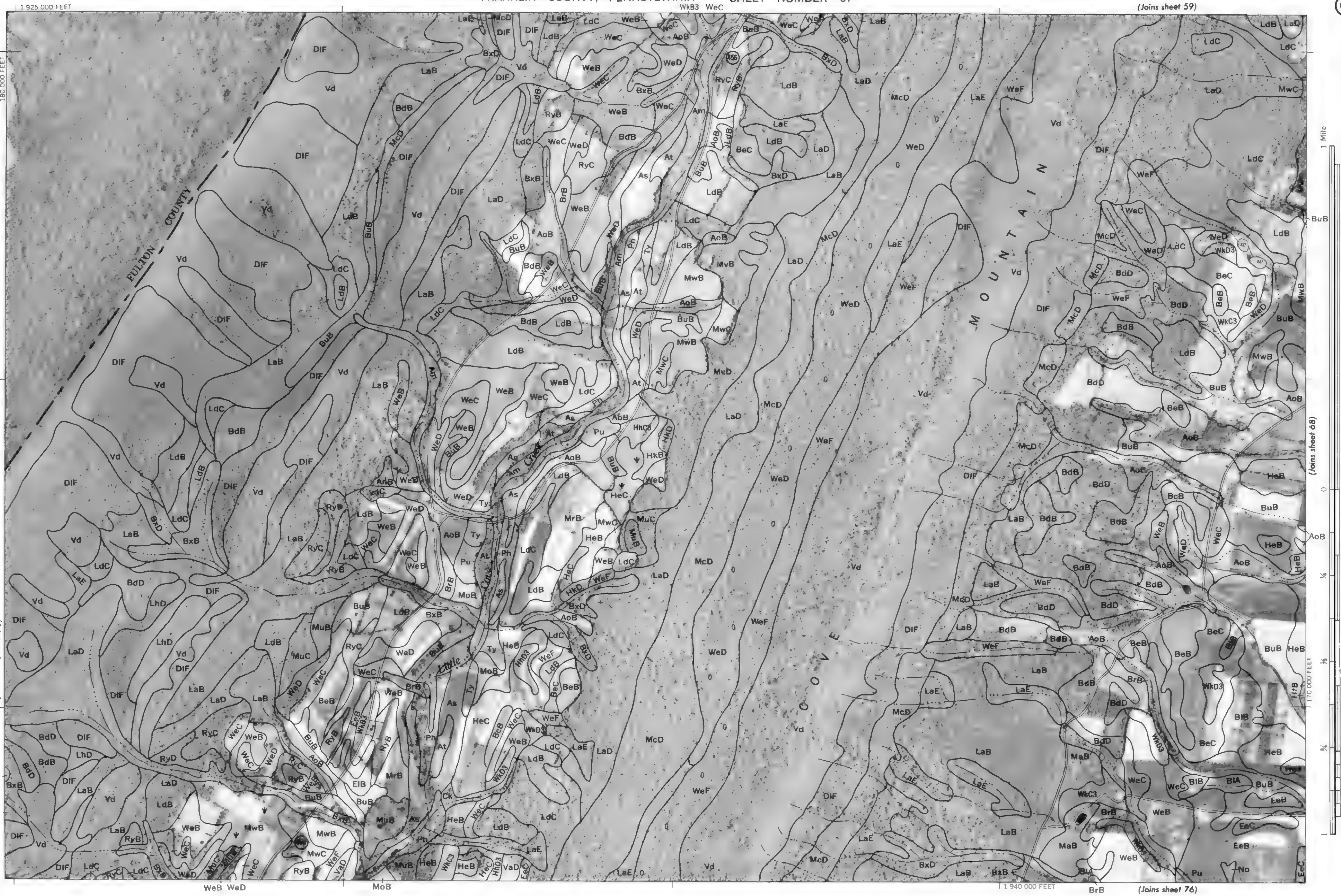
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 66



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.



FRANKLIN COUNTY, PENNSYLVANIA NO 67

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 68

(Joins sheet 60)

(Joins sheet 77)

N

Scale 1:15840

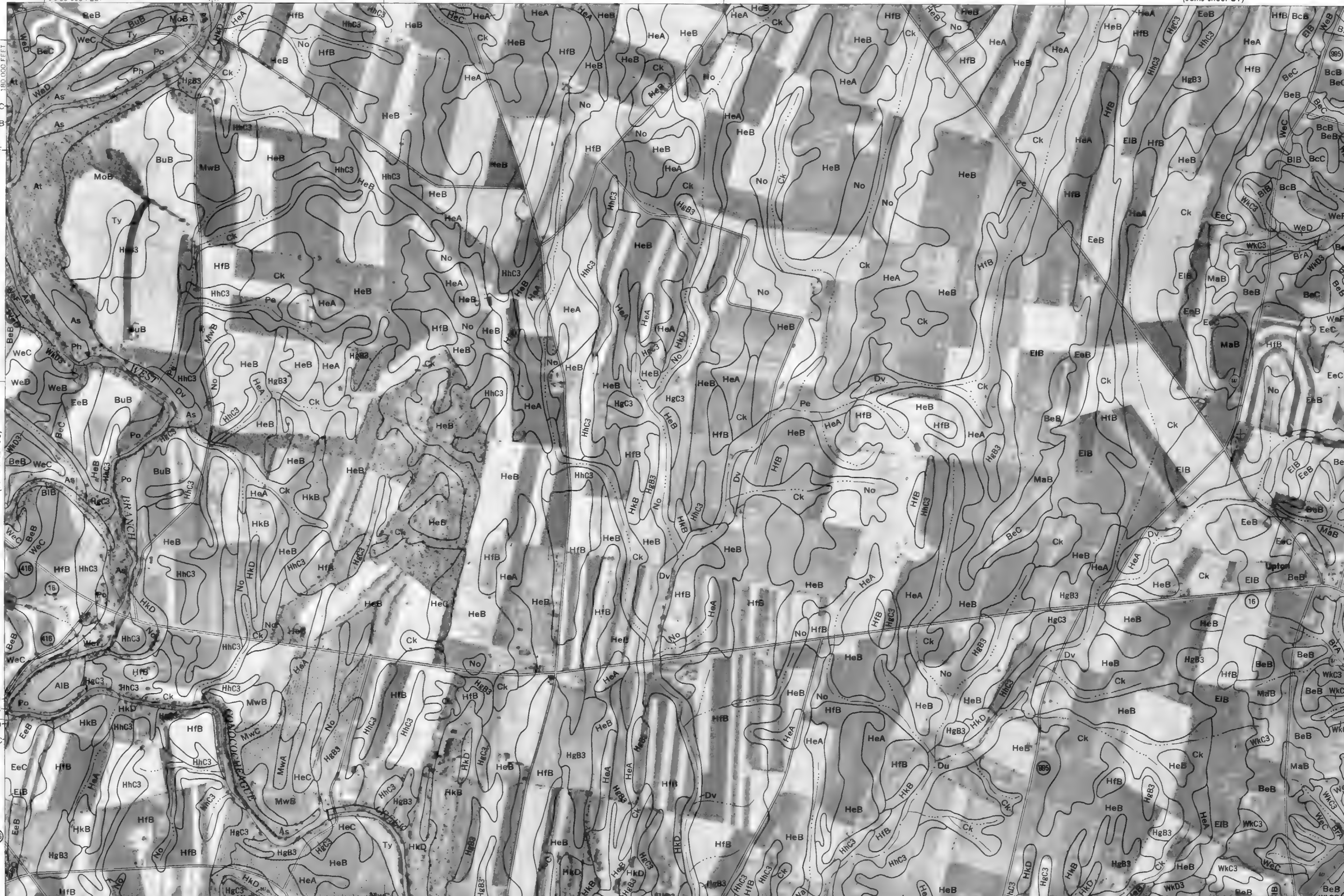
1 Mile

5000 Feet

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

69

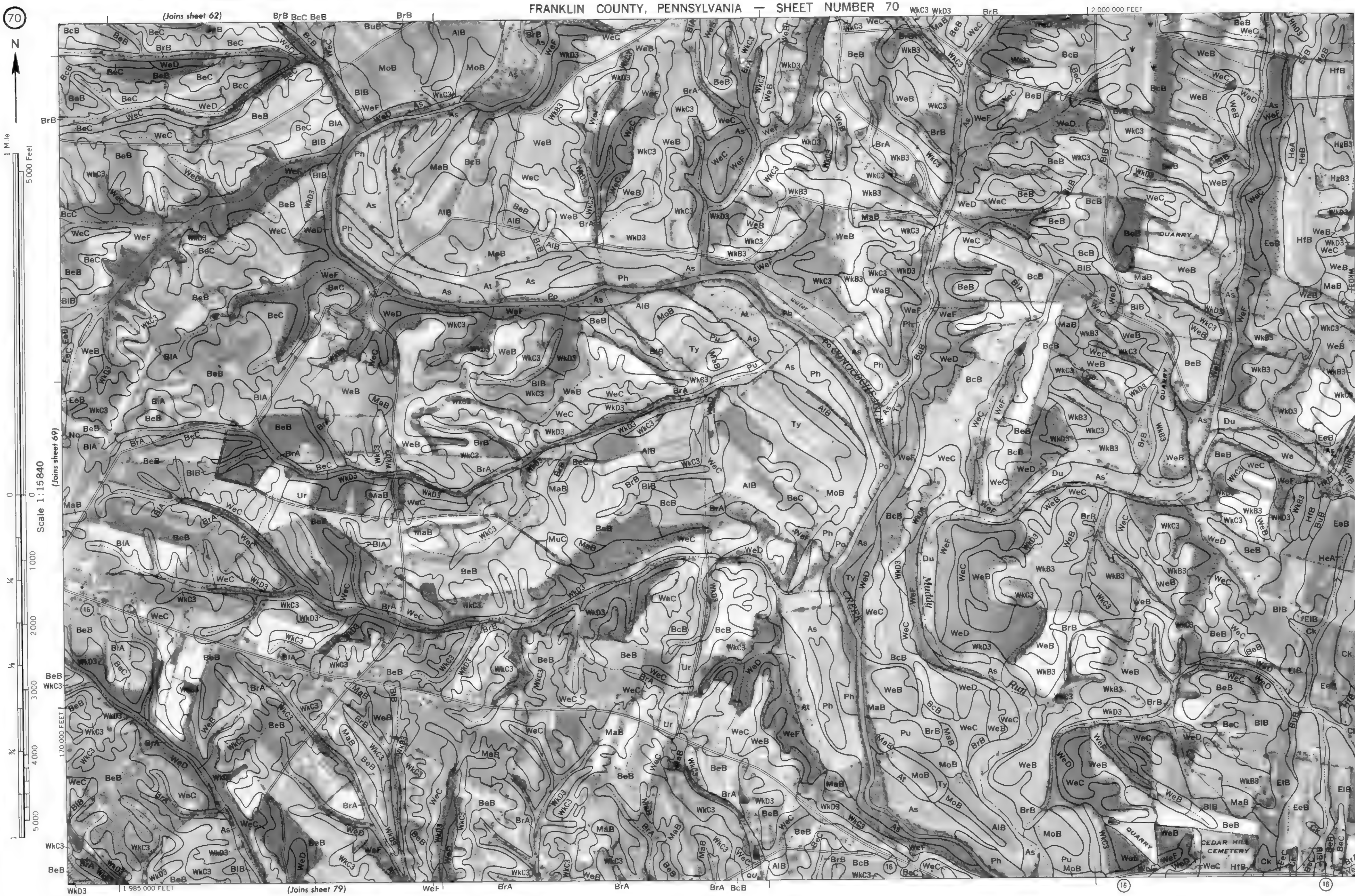


FRANKLIN COUNTY, PENNSYLVANIA NO 69

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 70

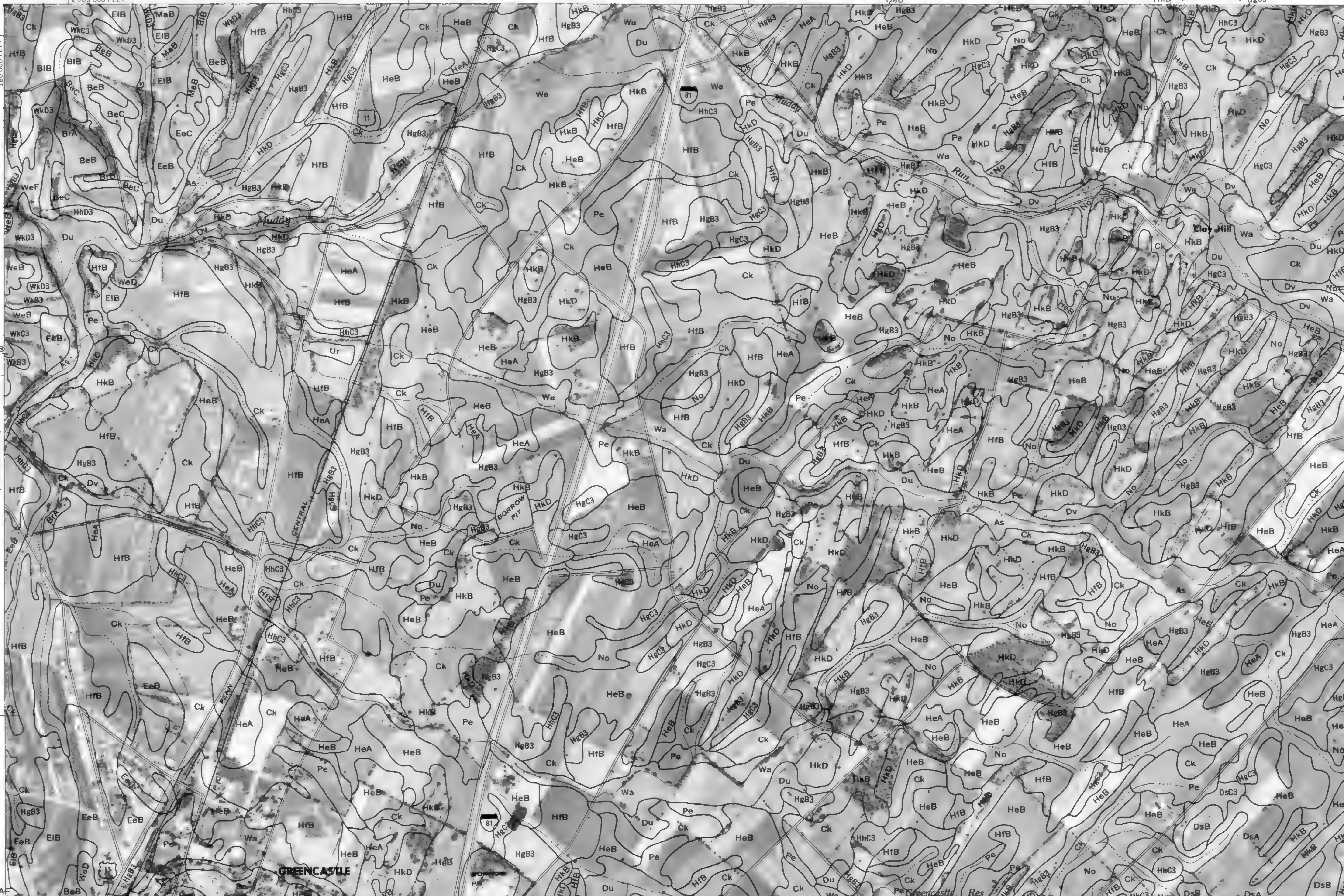


Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 70

(71)



FRANKLIN COUNTY, PENNSYLVANIA NO 71

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture and the Pennsylvania Department of Environmental Resources, State Conservation Commission.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

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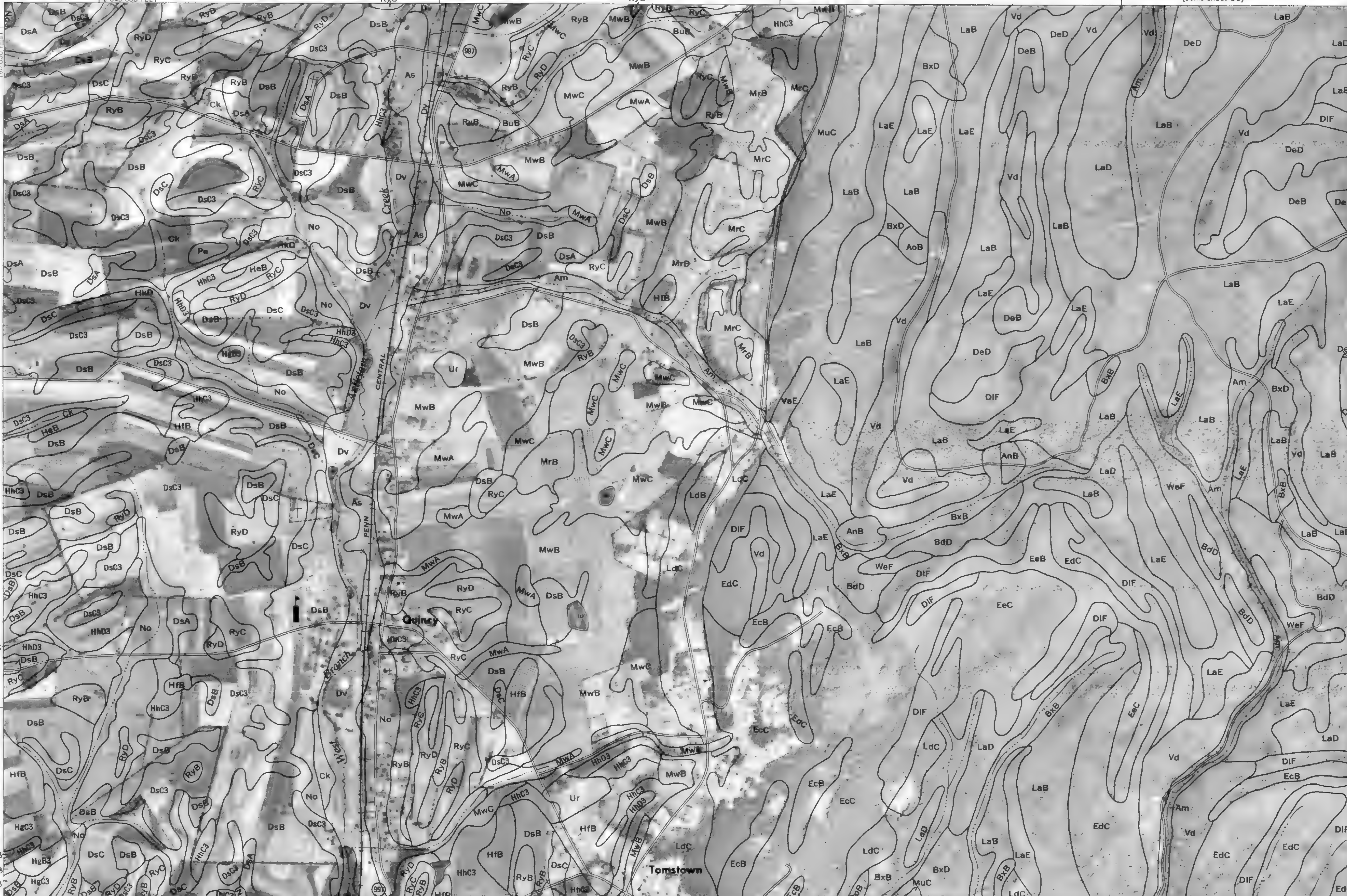
FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 73

73



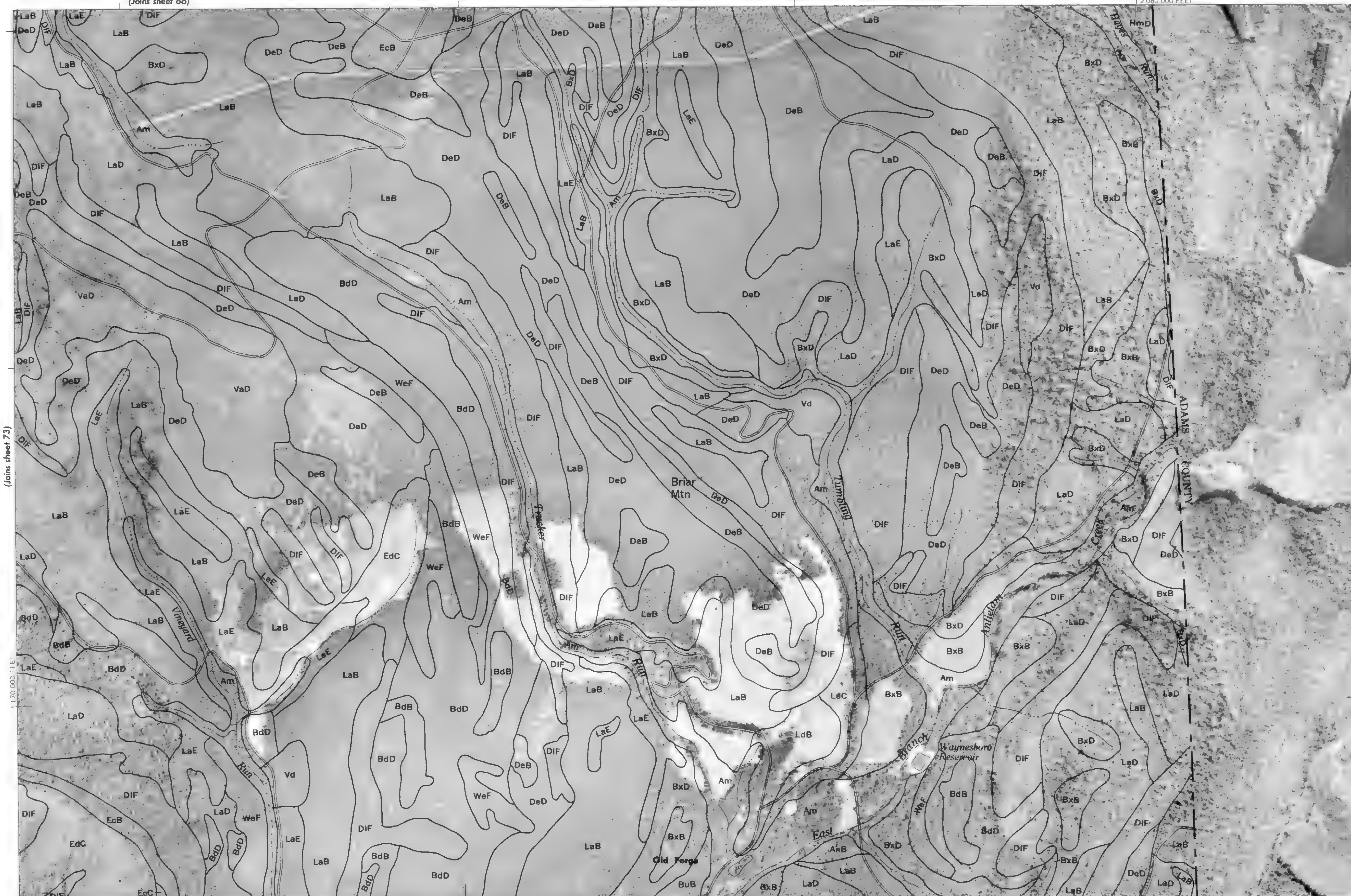
FRANKLIN COUNTY, PENNSYLVANIA NO. 73

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 74

(Joins sheet 66)



(Joins sheet 73)

(Joins sheet 83)

N

Scale 1:15 840

1 Mile

5000 Feet

0 1000 2000 3000 4000 5000

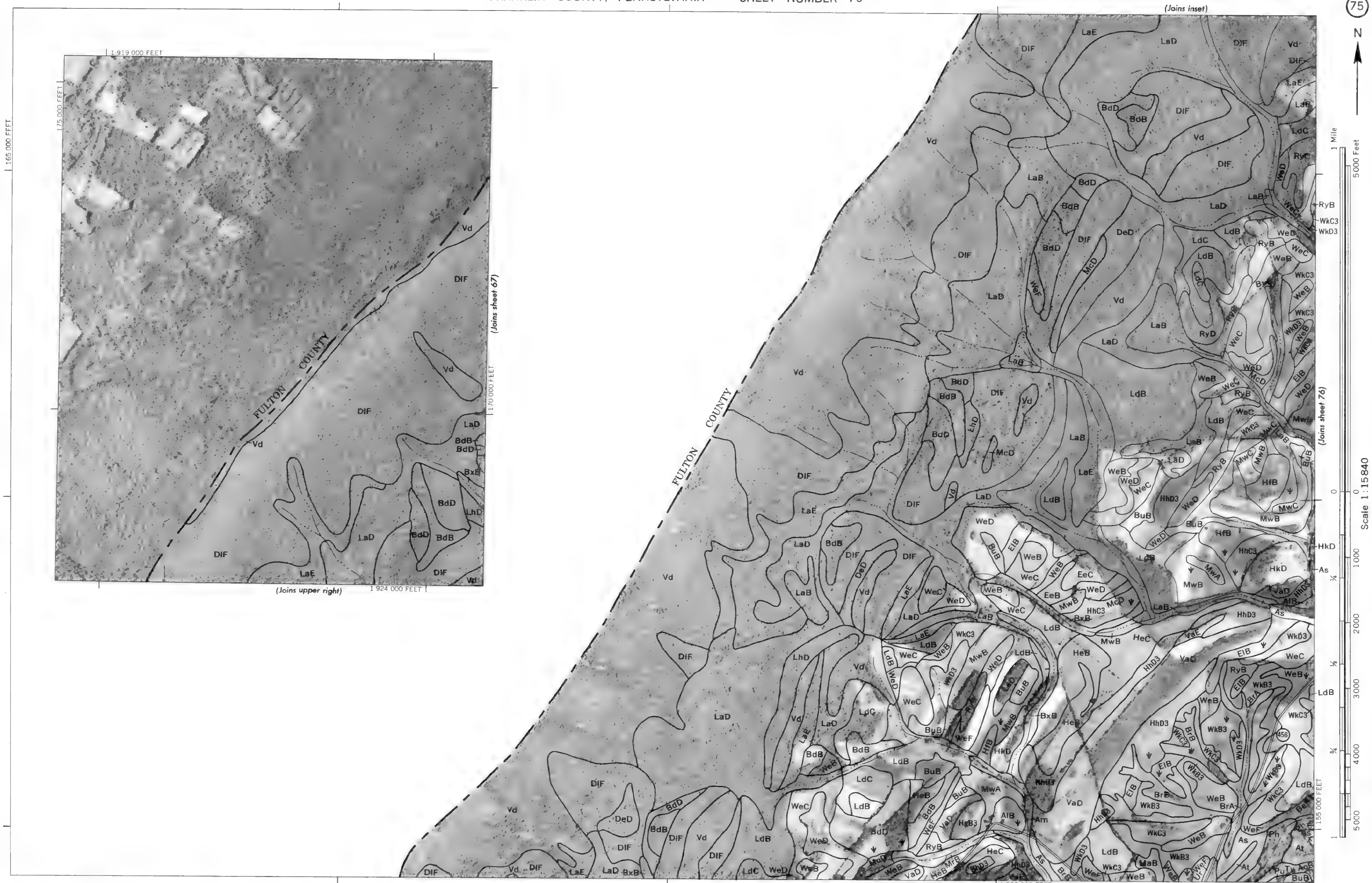
0 ¼ ½ ¾ 1

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission

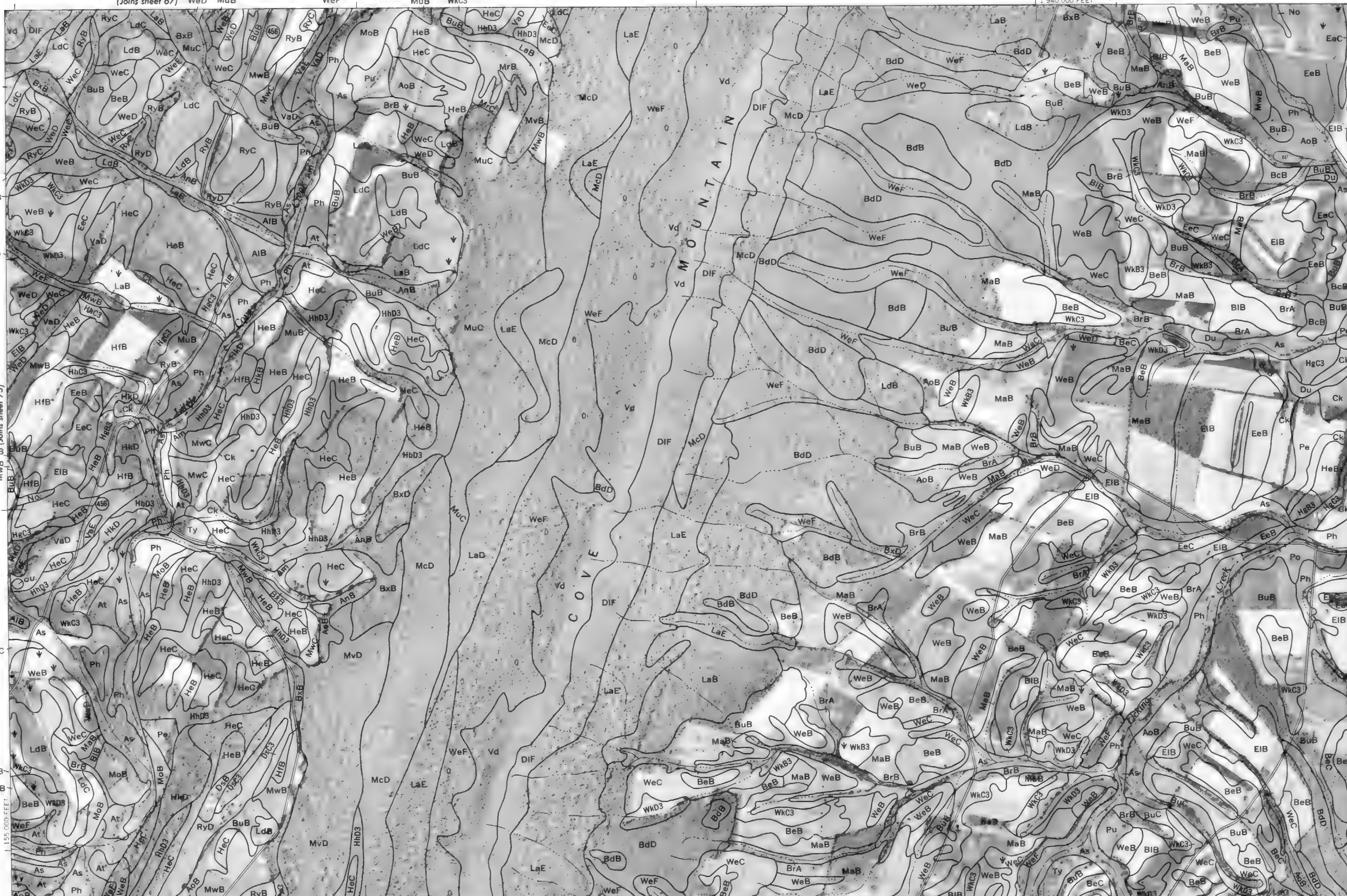
FRANKLIN COUNTY, PENNSYLVANIA NO. 75

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.



FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 76

(Joins sheet 67)



(Joins sheet 75)

(Joins sheet 77)

(Joins sheet 85)

Scale 1:15840

1 Mile

5000 Feet

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

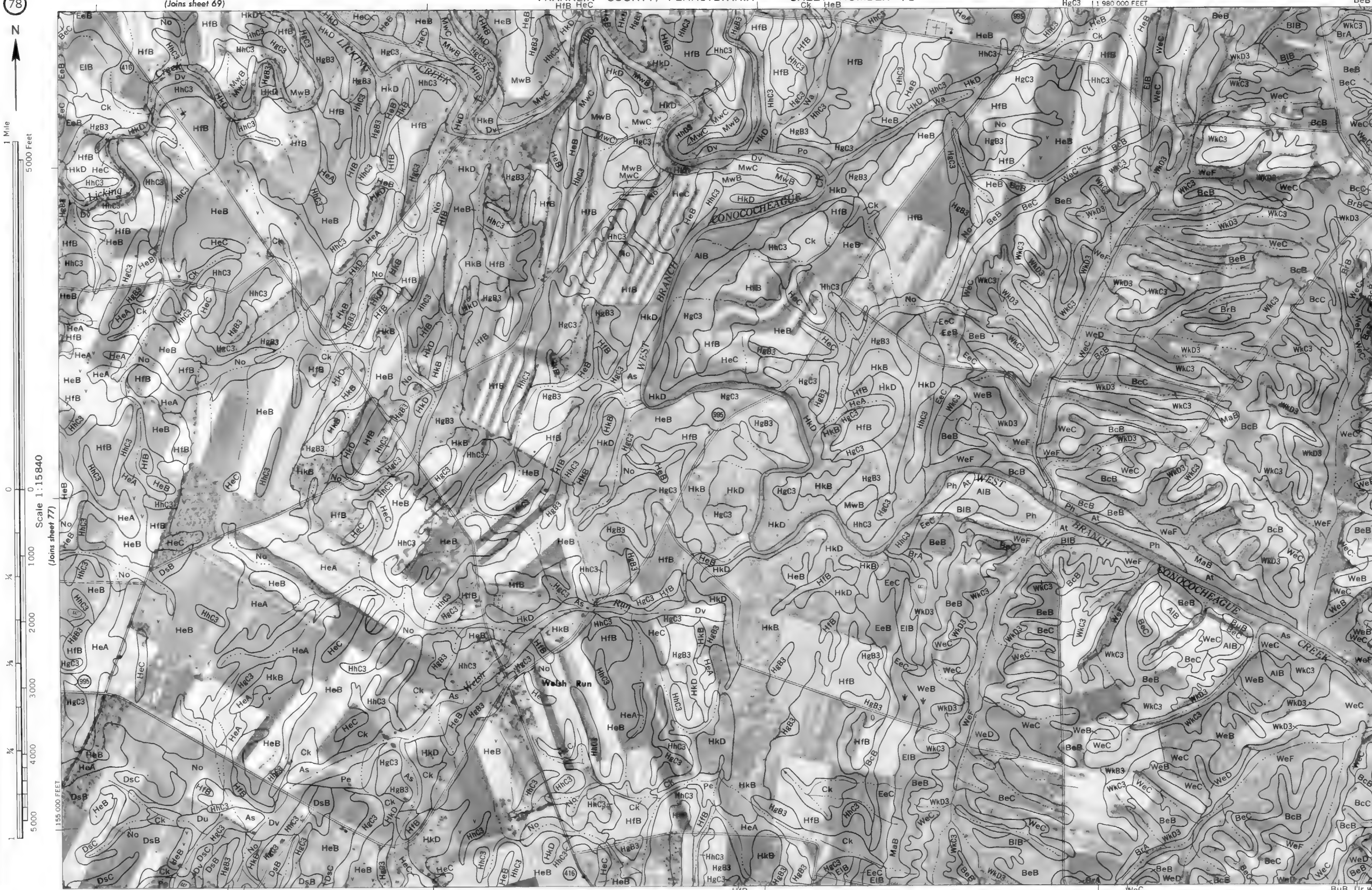
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 77

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 78



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 78

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 79

FRANKLIN COUNTY, PENNSYLVANIA NO. 79

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 80

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

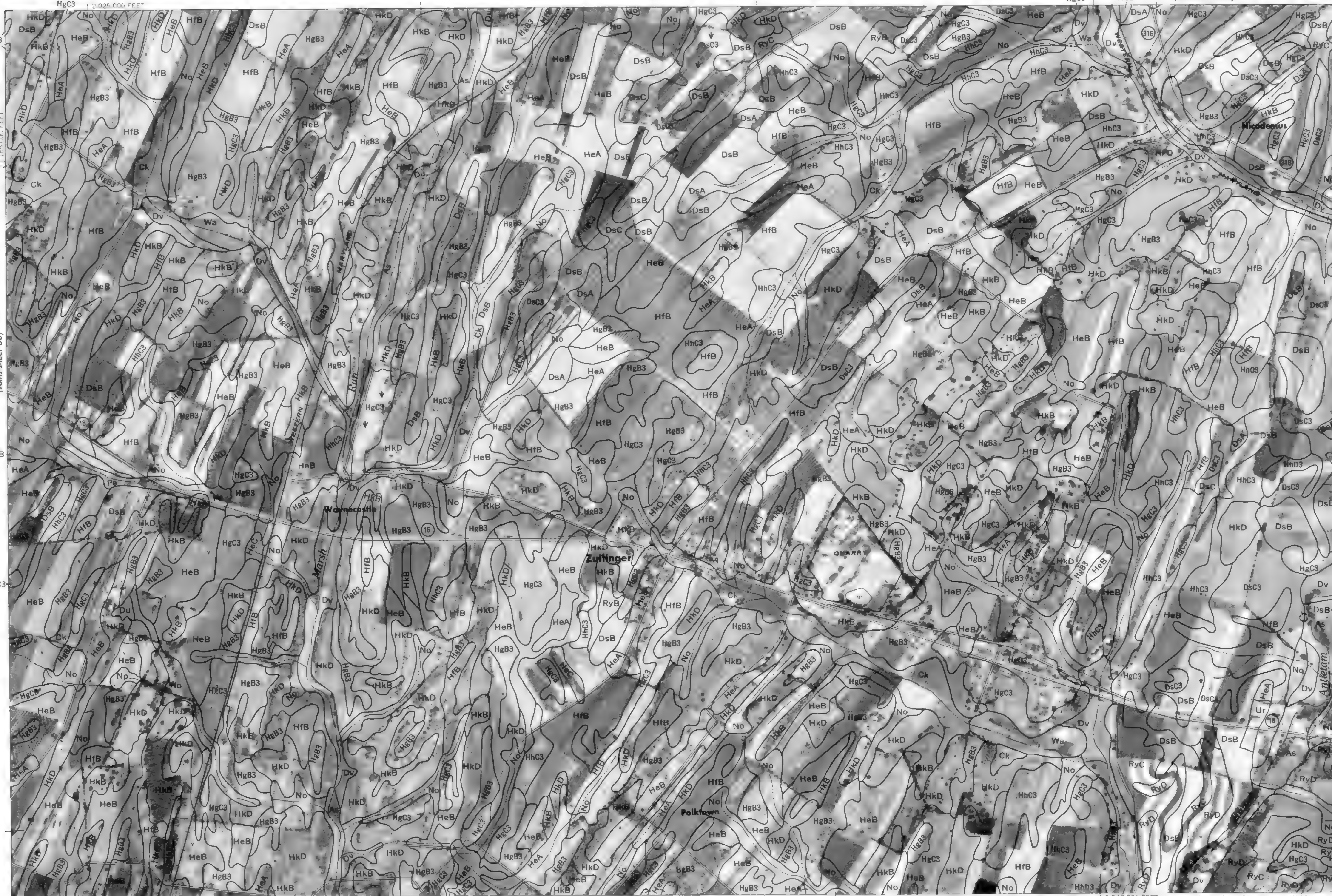
FRANKLIN COUNTY, PENNSYLVANIA NO. 80

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 81

(81)

FRANKLIN COUNTY, PENNSYLVANIA NO. 81

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission. Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.



FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 82

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

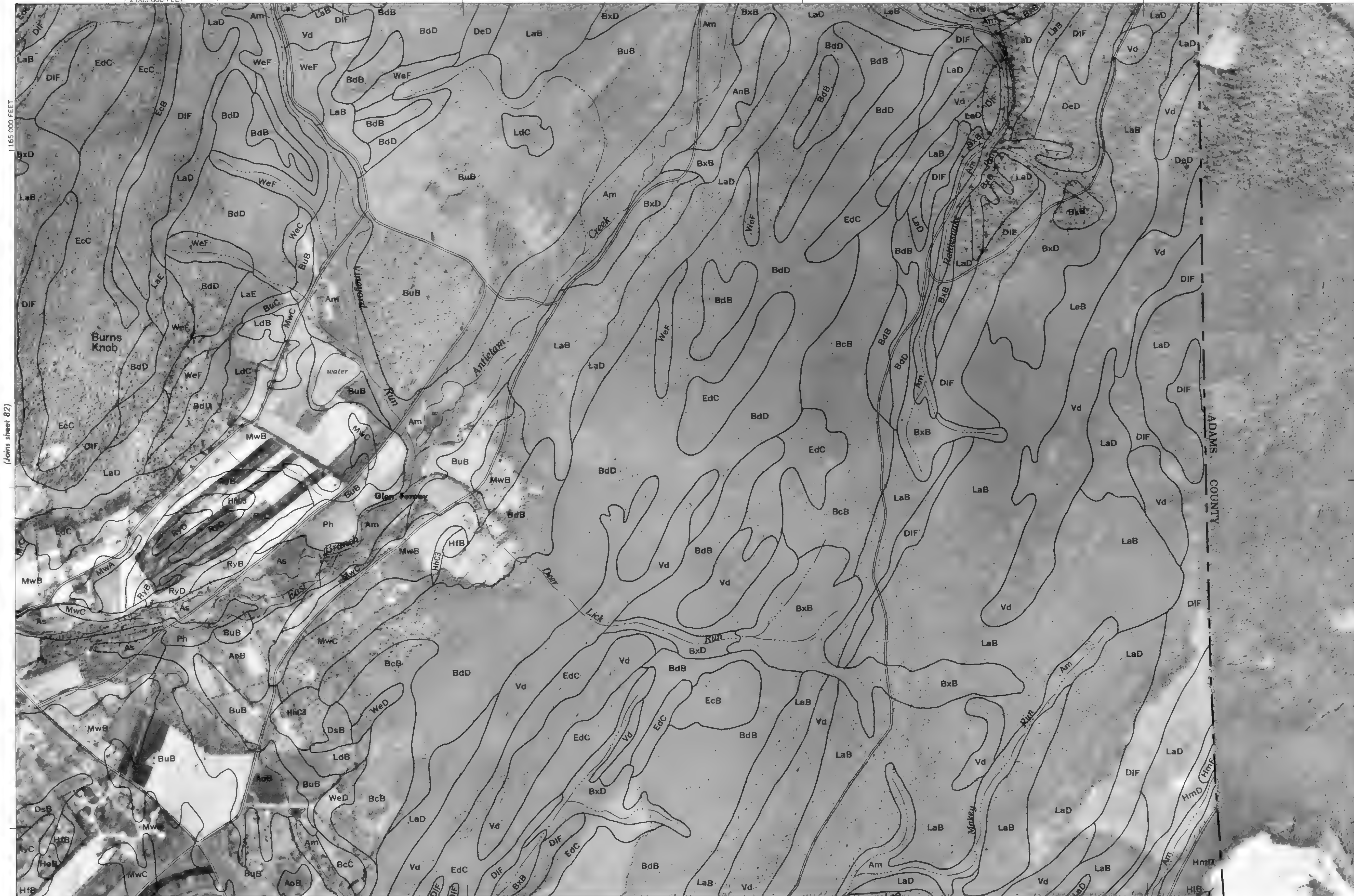
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 82

(Joins sheet 74)

2 065 000 FEET

165 000 FEET



(Joins sheet 82)

(Joins sheet 92)

2 080 000 FEET

155 000 FEET

N

Scale 1:15840

1 Mile ¾ ½ ¼ 0

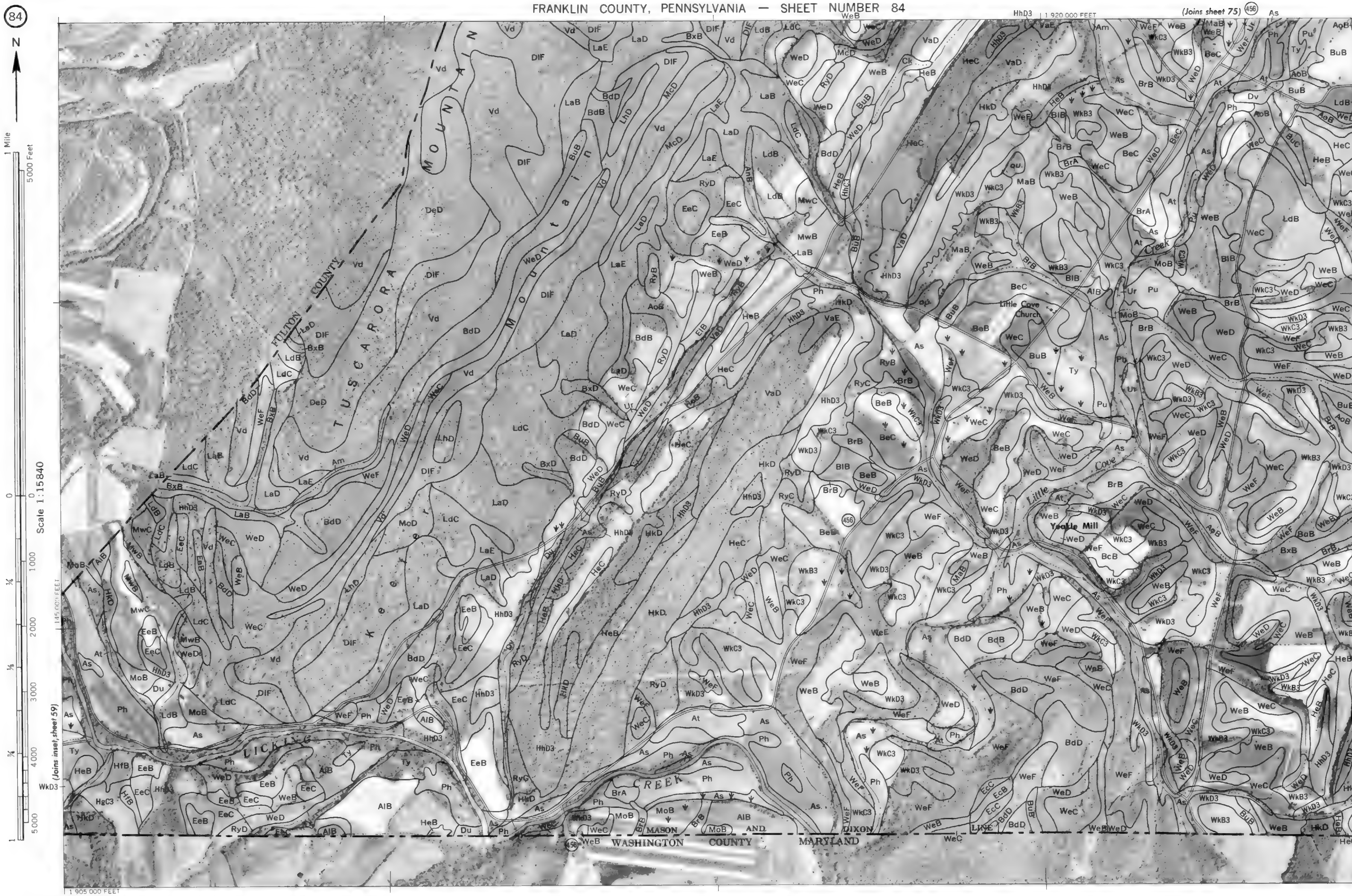
5000 Feet 4000 3000 2000 1000 0

FRANKLIN COUNTY, PENNSYLVANIA NO. 83

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

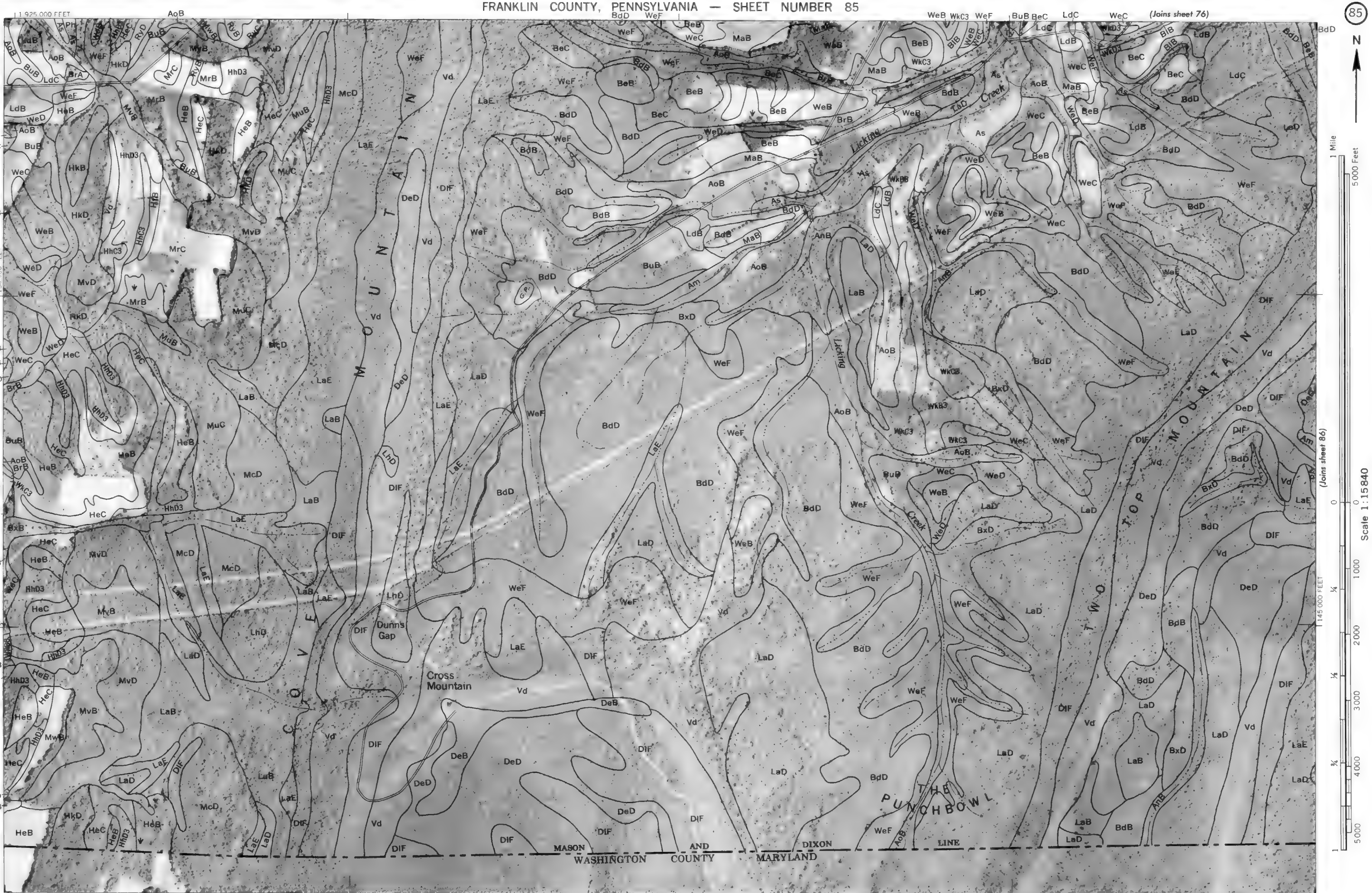
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 84



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

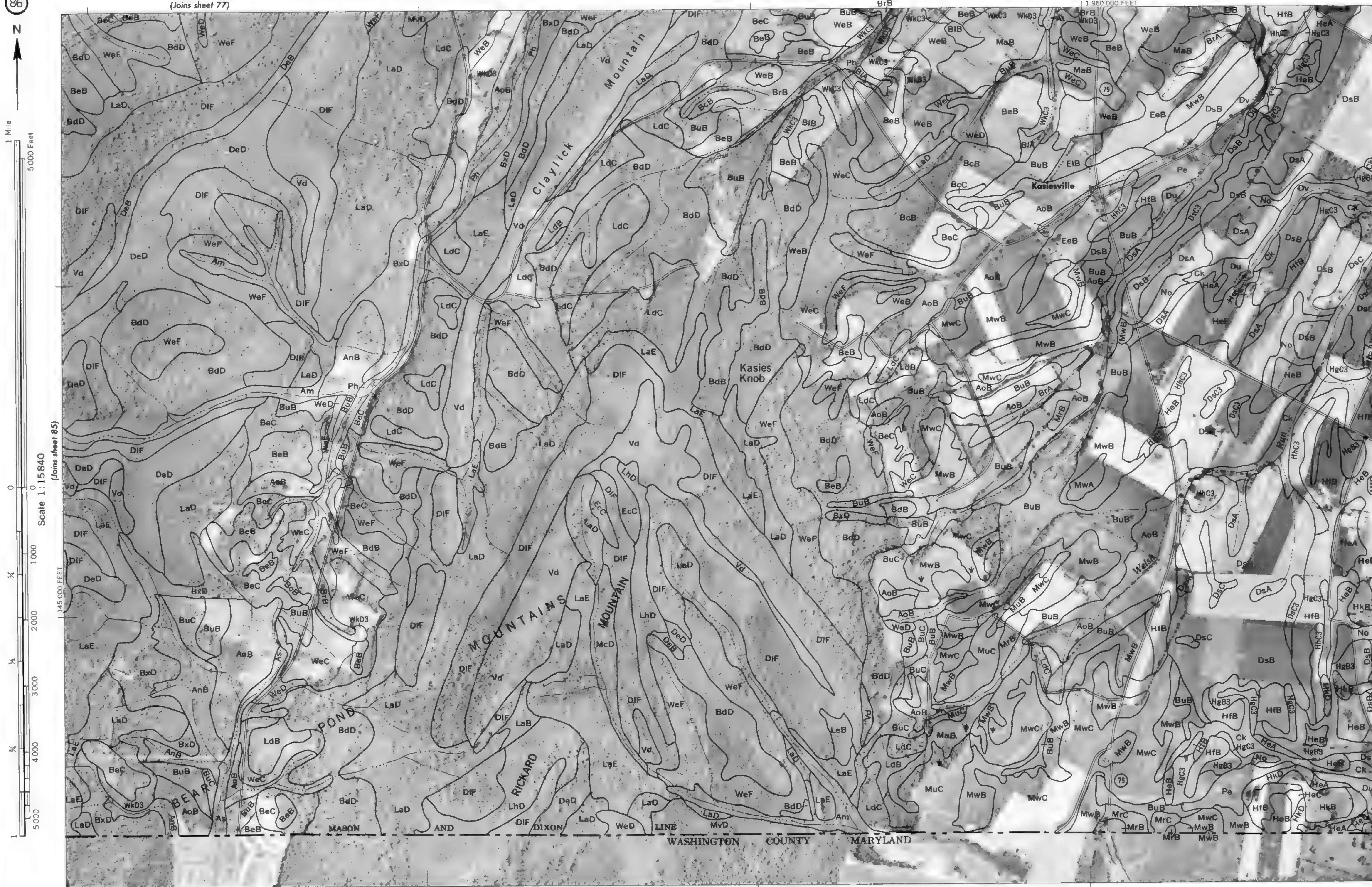


FRANKLIN COUNTY, PENNSYLVANIA NO. 85

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 86



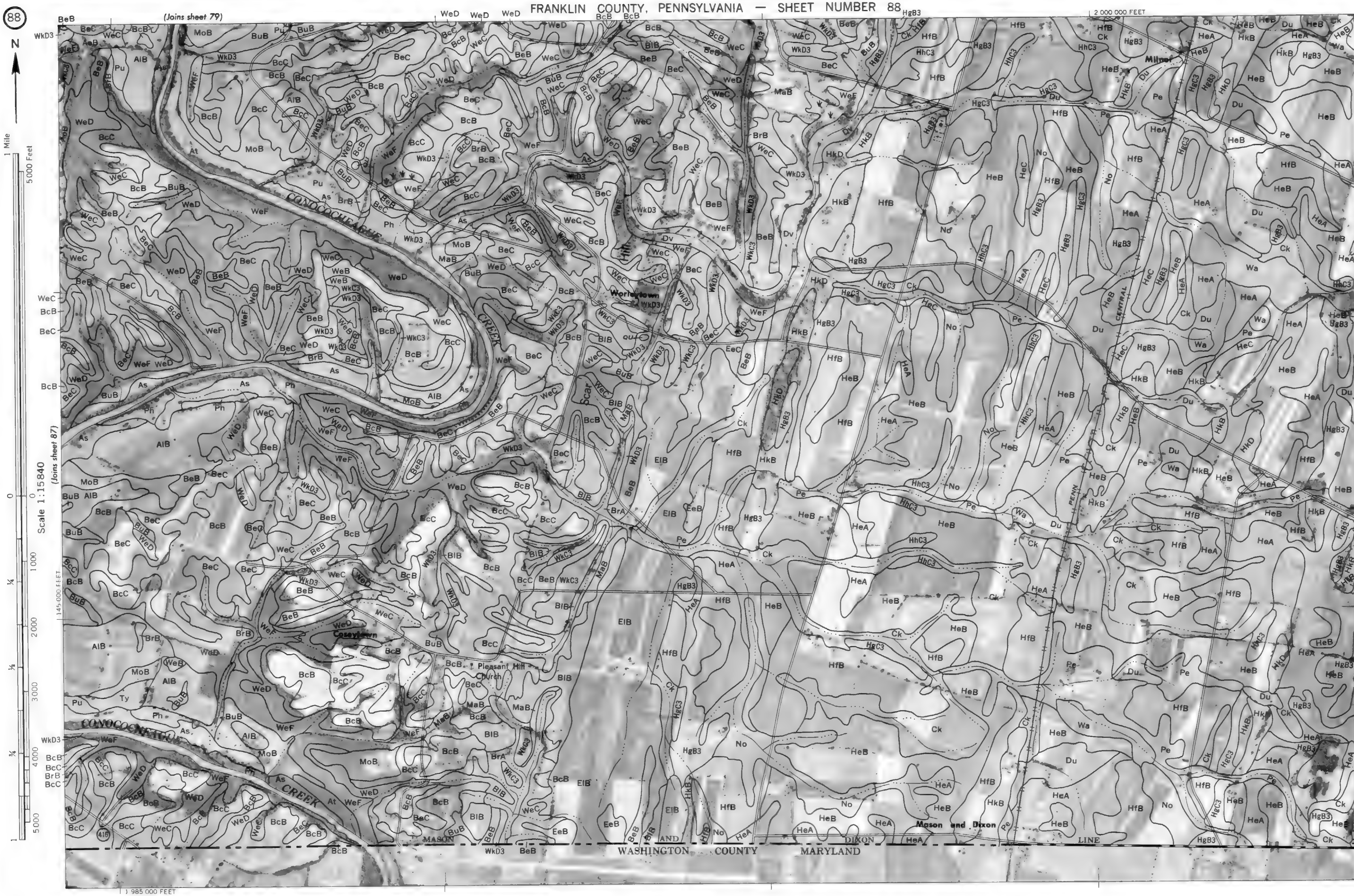
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA NO. 87

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 88



Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

N

Scale 1:15840

1 Mile

5000 Feet

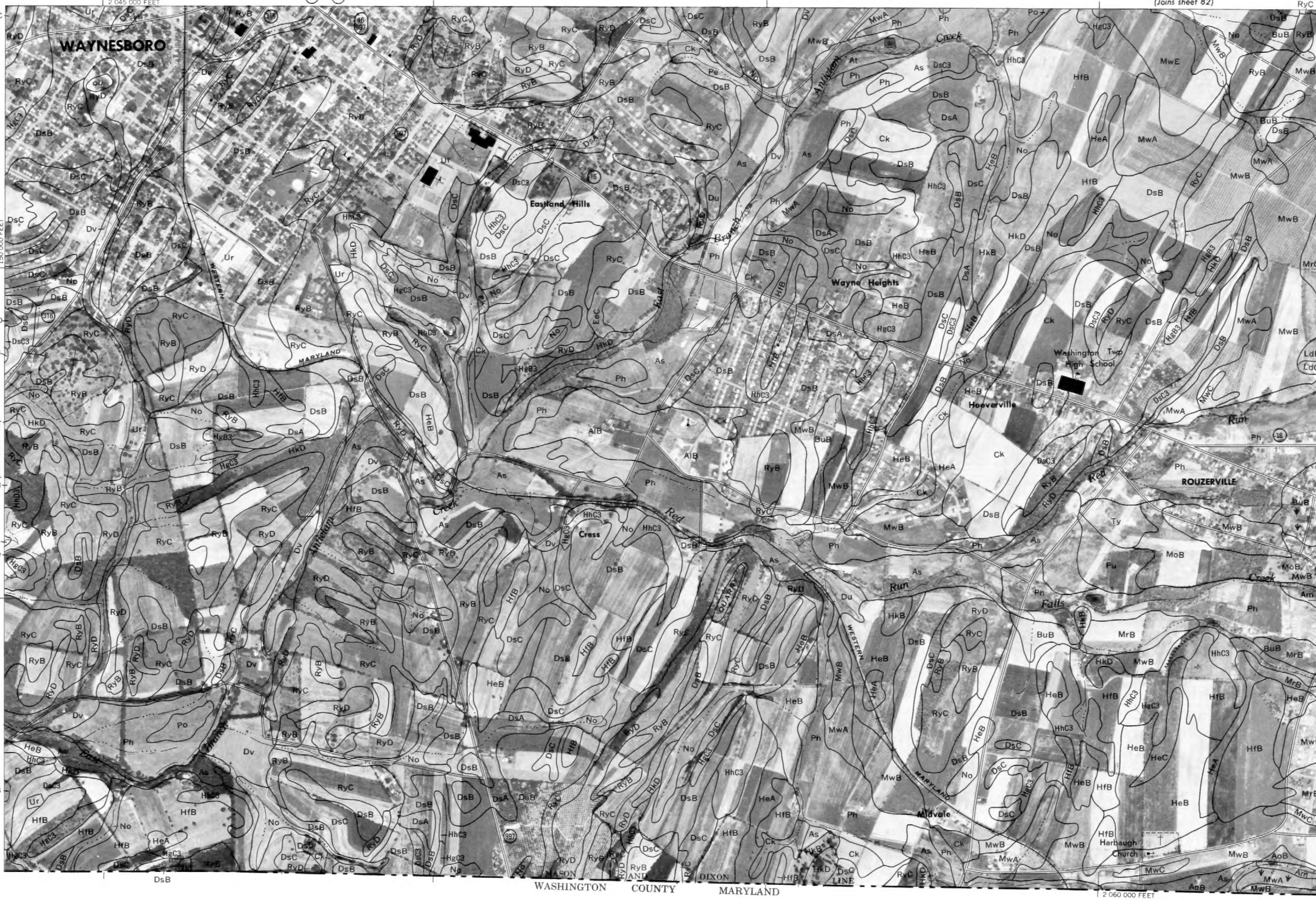
FRANKLIN COUNTY, PENNSYLVANIA NO. 89

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

FRANKLIN COUNTY, PENNSYLVANIA — SHEET NUMBER 90

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.



FRANKLIN COUNTY, PENNSYLVANIA NO. 91

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.
Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

N

1 Mile
5000 Feet
0
0 1000 2000 3000 4000 5000
¼ ½ ¾ 1
Scale 1:15840

Photobase from 1970 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Pennsylvania coordinate system, south zone.

This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission.

FRANKLIN COUNTY, PENNSYLVANIA

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads

- Divided
- Good motor
- Poor motor
- Trail

Highway markers

- National Interstate
- U. S.
- State or county

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail
- Railroad
- Ferry — FY
- Ford — FORD
- Grade
- R. R. over
- R. R. under

Buildings

- School
- Church

Mine and quarry — QU.

Gravel pit — G.P.

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

Located object

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line

- Perennial
- Intermittent

Streams, single-line

- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches

Lakes and ponds

- Perennial — water, w
- Intermittent — int

Spring

Marsh or swamp

Wet spot

Drainage end or alluvial fan

RELIEF

Escarpments

- Bedrock
- Other

Short steep slope

Prominent peak

Depressions (Large, Small)

- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

Soil boundary and symbol — Dx

Gravel

Stoniness
- Stony
- Very stony

Rock outcrops

Chert fragments

Clay spot

Sand spot

Gumbo or scabby spot

Made land

Severely eroded spot

Blowout, wind erosion

Gully

Borrow pit — B.P.

Sand pit — S.P.